# THE OPHTHALMOLOGY

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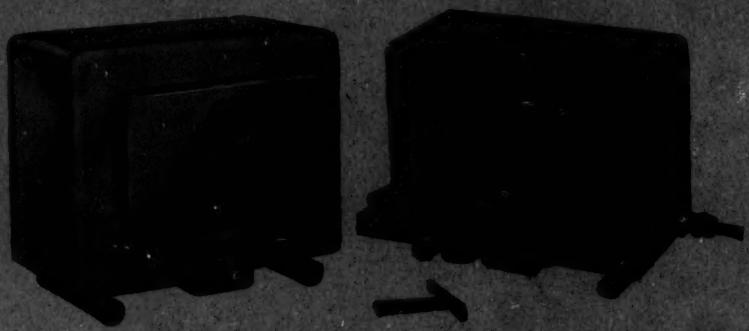

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OPHTHALMOLOGY

JANUARY, 1948

## COMMUNICATIONS

# TWO UNUSUAL SCLERO-CORNEAL NEOPLASMS*

BY

ARNOLD LOEWENSTEIN

GLASGOW

*and*

JOHN FOSTER

LEEDS

TRUE tumours of the sclera (if they in fact exist) are rare. Doubt has been cast by later investigators on most published cases.

Ginsberg, in his critical review of 1928, declared for instance that their existence must be regarded as unproven.

Fibromata are scarcely distinguishable in many cases from chronically inflamed tissue, in particular from keloidal scarring. The diagnosis of a true blastoma is also very difficult. If we except limbal melanomata and growths arising from corneal epithelium, the same is true of the cornea. Limbal swellings as a rule are neoplastic.

* Received for publication, July 12, 1947. From the Tennent Institute, Glasgow (Professor W. J. B. Riddell).

R7

In general, a neoplasm composed of cells of a mature type is regarded as less malignant than a tumour with little connective tissue, and densely packed nuclei varying in size and shape, and with many mitoses.

Experience shows that the clinical course is not always correctly prophesied by the findings of biopsy. Modern cancer research has provided new facts whose clinical bearing cannot be disregarded, although divergent conclusions have been based upon them.

Cancer is a biological problem, and a purely histological investigation may be regarded as inadequate in the days to come. It is possible we have overlooked a rare opportunity in the two following cases:-

## Case I

Geoffrey H., aged 15 years—A tumour resembling a phlycten was observed on the right limbus at 11 o'clock. It increased rapidly in size over two weeks.

The growth (Fig. 1*a* and 1*b*) was yellowish, painless, hard, and restricted to the quadrant shown. The overlying conjunctiva contained dilated vessels, and was freely movable.

The vision and the eye otherwise was absolutely normal. General examination, the Wassermann and Mantoux reactions, were negative.

As the swelling doubled in size in five weeks it was removed locally and sectioned. Biopsy, July 4, 1946—The tumour 3·5 mm. in diameter was fixed in formalin and embedded in paraffin. The tumour mass of tissue is partly covered by normal epithelium, the basal line of which is infiltrated with polymorphs, lymphocytes,

FIG. 1*a*.

Primary tumour.

FIG. 1*b*.

Primary tumour — looking down.

and many plasma cells. The major part of the tissue consists of spindle cells whose fibres cross each other and enclose a considerable number of blood vessels (Fig. 2).

The nuclei being oblong are distributed unevenly. The densest area is central, the nuclei being more sparse in the periphery. The nuclei show very few mitoses, but are variable in size and shape, There is no pigment. Certain clear spots may correspond to myxomatous and others to fatty changes. At the edge of the sections fatty tissue is actually present. Leucocytes are seen around vessels in places in considerable numbers.

We concluded from this that the tumour was a spindle sarcoma of low or moderate malignancy, though the unequal density of the tissue was rather striking.

After local excision the remaining tumour tissue continued to increase in size, contrary to the prognosis given above, and the eye was therefore excised ten weeks after the original biopsy, and fixed in formol-saline.

## The Excised Eye

The eye was sectioned equatorially and the ciliary surface of the tumour area examined by the slit-lamp (Fig. 3).

The entire retinal periphery within 6mm. of the ora serrata displayed a continuous wavy bluish white appearance. No nodules were visible. This colour change was most marked at the ora serrata underlying the tumour area, where the crests of the arcades are intensely whitish and convoluted, and can be traced over the surface of the ciliary body as far as the ciliary processes.

FIG. 2.

Biopsy specimen.
Haem. Eos. appr. 150×

FIG 4.

Infiltrative growth into cornea and sclera. H.E. 30× appr.

FIG. 3*a*.

Stereophoto — excised bulbus. Natural size.

There is little doubt that this is a continuation of the whitish layer on the peripheral retina.

Among the large portion of conjunctiva deliberately excised with the eye, can be seen a normal palpebral lacrymal gland with one duct. The vessels are congested, and there is diffuse plasmocellular infiltration.

This swollen infiltrated conjunctiva has grown over the peripheral cornea, and overlaps the un-infiltrated part of the cornea (Fig. 4).

There is no definite boundary between the inflamed tissue, and the tumour infiltrating the outer third of the cornea and sclera.

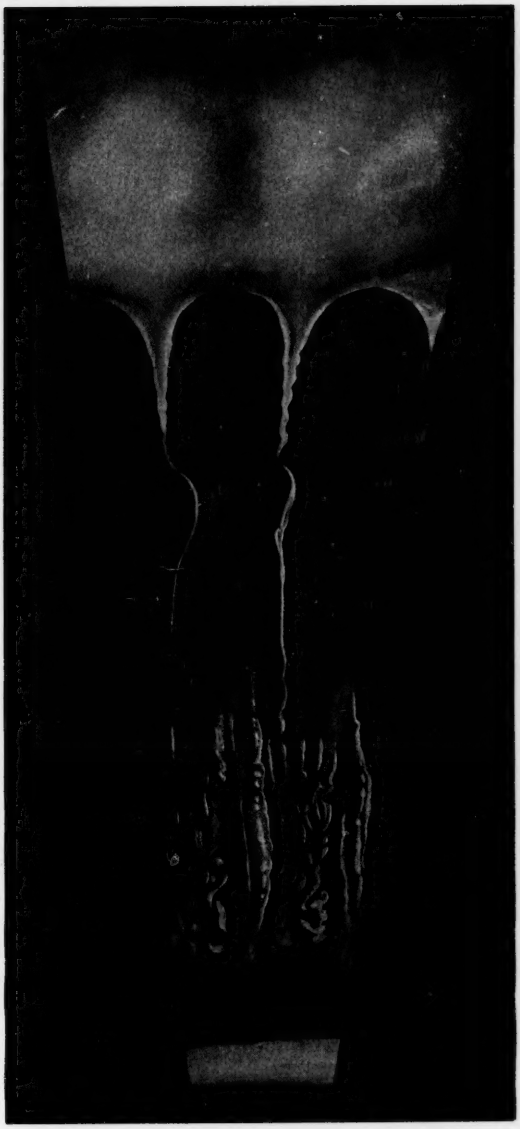

FIG. 3.

The tumour infiltration extends about 1·4 mm. from the limbus into the cornea, and remains localised to the outer lamellae. The limit of the tumour on the sclera is ill defined. It is impossible to define where the new growth in the sclera ends, and inflammatory tissue reaction starts.

The nature of the tumour coincides with the biopsy specimen, though the crisscross pattern of the spindle cells is less regular, and there are no more lymphocytes round the vessels. Pyknosis is frequent.

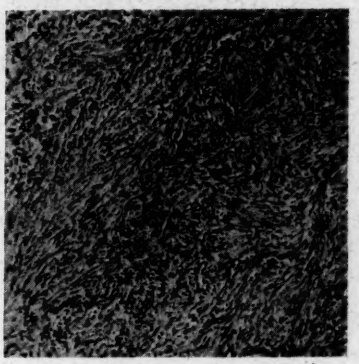

FIG. 5.

Medium power (appr. 150×) from Fig. 4×.

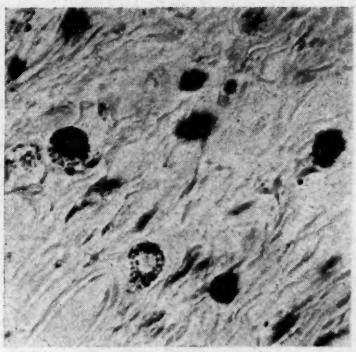

FIG. 6*a*.

Thionin staining at iris root. 1000× approx. Mast cells and free mast cell granules.

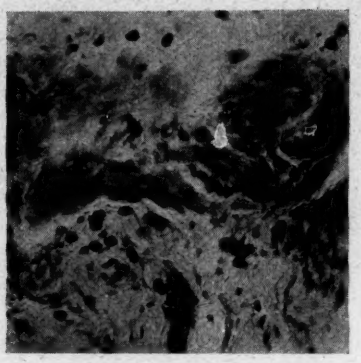

FIG. 6b.

Giemsa staining — Mast cell granules and mast cells in the outskirts of the tumour. (300 X approx.)

The fibres of the spindle cells are a greyish pink, and the intact scleral fibres with which they interlace eosin red. The photomicro does not show this colour contrast vividly in the specimen. Here and there are syncytial aggregations of ten and more nuclei, strongly suggestive of giant cells. They are located around small vessels at the edge of the growth.

Few pigment granules are seen in the trabeculae of Schlemm's canal. There is a slight eversion of the pigment epithelium, and no inflammation of the iris. The retina is, especially in its anterior part, covered by an attenuated, much convoluted layer, containing fibrils, red blood corpuscles, and fine pigment granules. It corresponds with the curled threads (Fig. 3), and is unconnected with clearly seen glassy zonula fibres.

There are an unusual number of mast cells in the iris and ciliary body, and underlying the tumour area, less frequent in the choroid. Their granules are metachromatic, and well marked with Giemsa, Leishmann, methylene-blue, but are also recognisable with Van Gieson, haematoxylin-eosin, Mallory and Masson. In contrast to the usual lobate or kidney-shaped nucleus the nuclei are here round or oval, and the cell diameter 10-14 mu. against the usual average of 8-10 mu. (Whitby & Britton, 1946).

Typical fibroblasts are visible in the growth packed with small metachroic granules.

## Discussion (Case I)

The growth consisted of mature cells. The concentration of the nuclei was unusually variable, being diffuse in the periphery and concentrated in the centre.

The tumour infiltrates the sclera, and has no clear line of demarcation, so that even at the centre of the growth area the tumour cells are seen in the interstices of normal scleral fibres, an unusual appearance in typical malignant new growths of this area. The nuclei at the periphery of the growth assume groupings, suggesting giant cells in many places.

Masses of mast cells spread into the uvea from the tumour area.

If we add to these findings, the clinical facts that the growth was hard in consistency, painless, and rapid growing, it is not easy to classify it as a common mesodermal malignant blastoma, and casts doubt on our original diagnosis, which led to excision of a functioning eye.

It is true that the clinical appearance primarily led to this decision, but even after careful histological investigation it is difficult to "type" this growth with certainty.

Obviously it is not an infectious granuloma, nor a keloidal formation; certainly it is not a scleritis.

Our impression is of a tissue reaction to an agent, which unlike most pathogenic organisms does not produce cellular destruction but cellular division (Borrel).

Rous, in 1910, was the first to describe a tumour which was a transmissible and filterable sarcoma of chickens, followed by Fujinami and Unamoto in 1911, with their myxosarcoma. No tumours of this type have been described as yet in man.

Assumption of a virus aetiology would explain why the mode of

FIG. 7a.

Rous's sarcoma. H.E. 60X. Strands of tumour tissue growing between healthy muscle tissue.

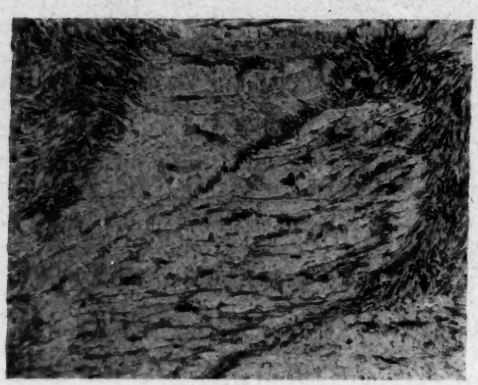

FIG. 7*b*.

Fujinami's myxosarcoma. H.E. 60×.

growth in our case differed from the picture we are used to find in a true blastoma of this region.

On studying the slides of two virus tumours, a Rous sarcoma and a Fujinami tumour, by the kindness of Dr. Peacock, I (A.L.) was amazed by the mode of infiltration of the new growth which splits normal muscular tissue by many tumour strands. We have found no mast cells in Giemsa stained slides—but have no information about the occurrence and behaviour of this cell form in birds.

Proof of the assumption of a virus aetiology of this new growth is a difficult matter, as a routine microscopic investigations will not at present render a virus visible unless it forms inclusion bodies. Future investigation with the electron microscope promises to show the filter passing virus particles directly.

Injection of tumour material into the anterior chamber of an animal was considered too late to apply it, and the best animal species for this purpose has yet to be established.

Virus tumours grow best in traumatized tissue especially young fibroblastic tissue according to Oberling.

No precedent trauma was observed in this case. It was pointed out, however, by Dr. Peacock (a pioneer in experimental cancer research) that a small skin dose of X-rays (600 r) might produce a local fibroblastic reaction from the virus if it was still in the circulation. As the boy had been irradiated post-operatively, we enquired but were assured by the Radiologist that no reaction of this type had been detected in or around the orbit from the first small doses used to estimate the amount of irradiation that could be safely given.

This negative finding will not, however, exclude a virus as cause, as by this time the virus might have left the circulation if in fact it had ever entered it.

The assumption of a virus aetiology for this limbal tumour, therefore, remains guesswork only.

### Case II

Annie S., aged 65 years.—Little history could be obtained in this case. The patient stated that the left eye had always had good sight with glasses (+3·0), and that the right had been blind about fifteen years, while during the last five a growth had appeared on the eye. She denied any form of ocular injury.

On examination the lower two-thirds of the right cornea displayed a whitish cauliflower-like growth of firm consistency, elevated about 2mm. above the surface at its highest point. All investigations including the Wassermann and Mantoux reactions were negative.

The condition was obviously neoblastic, and the eye blind. Excision was performed on January 9, 1947, and the eye preserved in formol-saline.

*Histology.* The lower two-thirds of the cornea are covered by a fungus-like growth about 1·25 mm. thick (Fig. 8). An irregular epithelium two to five rows in thickness invades the growth to a

FIG. 8.

Corneal fibroma — with myxomatous and calcareous degeneration. The tumour rises from the tissue of a pannus degeneration. H.P. 30× appr.

depth of 3-500 mu thus dividing it into segments (Fig. 9). The epithelial covering is complete except for a central area of about 0·3 mm.

The cornea underlying the growth has a more or less well preserved Bowman's membrane, but no epithelial covering. The tumour itself is composed of fibrous strands of varying diameter, some containing metachromic granules. The external fibres are

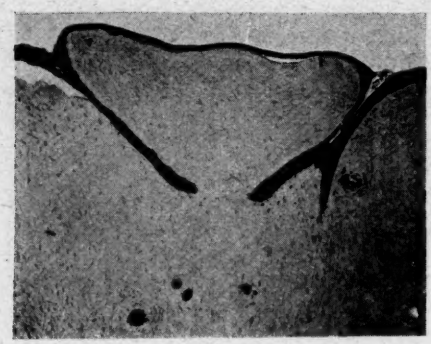

FIG. 9.

Corneal fibroma. H.E. 120× appr. Epithelial outgrowth divides the tumour in its outer rim. The deeper layers of the tumour are vascularized.

parallel, with a few interstitial nuclei. The deeper fibres are arranged in a crisscross manner, and are more vascular. Small areas without nuclei or fibres suggest myxomatous degeneration. An irregular line of calcareous tissue runs obliquely through the growth.

The tumour free area of the cornea is covered by a vascular degenerative pannus, which pierces Bowman's membrane here and there.

The corneal parenchyma is normal, except for some deep peripheral vessels.

*Iris.* There are broad root synechiae of the extremely atrophic iris, and extensive supra-intra-and pre-choroidal and pre-retinal haemorrhage.

*Retina.* The retina itself is degenerate with intra-retinal hyaline patches, which here and there penetrate the limiting membrane, and spread in a pre-retinal plane. This pre-retinal tissue contains many thin-walled vessels with a wide lumen. Giemsa staining shows many large mast-cells in the pannus, especially at the edge near the tumour. Fibroblasts within the tumour are full of metachromatic granules.

## Discussion (Case II)

Such tumours of the cornea have been described by several authors. Ginsberg (1905) referring to a corneal tumour in a nine years old child, covering the whole and destroying a considerable part of the cornea, expressed his belief that these corneal tumours are inflammatory pseudo-tumours, although they have been described as fibromata, myxofibromata, or myxomata.

Ginsberg found many mast cells and mast cell granules within the outskirts of the tumour tissue. His mast cells were as a rule unusually large (like those described in our case).

The tumour of Case II is a relatively acellular, slow growing fibroma, with a sign of regressive change in the shape of calcareous and myxomatous degeneration.

The numerous mast cells in both pannus and the tumour outskirts, and the mast cell granules filling the fibroblasts of the tumour, are reminiscent of a chronic inflammation. The growth has originated in the pannus. An unusual stimulus is supposed to have caused this type of pannus newgrowth. The stimulus might have been of mechanical, chemical, or biological nature.

If a mechanical stimulus is present, *e.g.*, by exposure to atmospheric influences, tyloma-like corneal thickening is observed frequently in such cases, *e.g.*, Loewenstein has described cystic growth of corneal epithelium after a chemical stimulus with local burning with chloroform during general anaesthesia. Ichikawa (1913) has described a typical progressive Mooren's ulcer exactly at the place where seven years before the cornea was burned by chloroform.

Nothing in the history suggests that either of the first two possibilities played any part, though one cannot exclude them entirely.

On the other hand, a biological stimulus is a possibility.

In 1931 Shope described fibromata in wild rabbits due to a transmissible filterable virus, and in 1932 a warty like growth which when transferred to domestic rabbits might undergo malignant metaplasia.

Oberling quotes a most interesting experiment performed by Green, Goodlow, Evans, Peyton, and Titru, who transplanted a wart from the eyelid of a seventy-one year old man into the anterior chamber of three monkeys. In each case epithelial tumours developed in the anterior chamber of the monkey, and in the conjunctiva at the site where the needle penetrated.

Laryngeal papilloma, condyloma, and the common wart in man, are known to be of virus origin. We suggest, therefore, as a possibility that this conversion of pannus into tumour tissue may be due to a virus, and might be transmissible to animals. Unfortunately the idea of such an experiment came too late.

## Summary

A description is given of two unusual pathological cases:—

(*a*) A hard painless limbal growth of rapid growth infiltrating both cornea and sclera and with dilated vessels in the overlying conjunctiva. This was removed locally. Histologically this proved

to be a spindle cell sarcoma of a mature type, unequal cell distribution, markedly vascularised with giant cell formations in the vessel walls. A considerable number of large mast cells with a big round nucleus were present. Metachroic granules fill the plasm of certain fibroblasts and are also found free in the tissues.

As the clinical progress was more rapid than the histology would suggest, the eye was excised. A milky film was found at slit-lamp investigation covering the retinal periphery, and continued forward over the ciliary processes. There were no signs of uveitis,

It is possible that the tumour may belong to the group of neoplasms much studied in the last three decades by Rous (1910), Fujinami and Unamoto (1911), Shope (1932), and many other authors.

These authors have described transmissible tumour caused by a filterable virus in birds and wild rabbits. Angiosarcomata, myxosarcoma, and endotheliomata with a virus aetiology have been found in birds as well. Virus-caused tumours are known to exist in man, *e.g.*, the common wart, condylomata, and laryngeal papilloma.

(*b*) In the second case a benign fibroma containing areas of calcareous and myxomatous degeneration is described arising from a degenerative pannus.

A large number of mast cells are found in both growth and surrounding pannus tissue, and mast cell granules fill the protoplasm of many fibroblasts.

It is suggested that the agent producing the metaplasia may be a virus similar to the Shope fibromatous type in wild rabbits.

This suggestion is speculative, and without proof, as the idea of animal inoculation was a fruit of the histological investigation when it could no longer be carried out.

This must remain an unproved speculation, as the histological investigation which suggested it destroyed the material needed for the biological experiment which alone could have afforded proof.

Such cases should, therefore, in future be considered "***ab initio***" from the biological before the histological angle.

The amount of material required for injection into the anterior chamber of a rabbit (or better still a monkey) is so small that it need in no way prejudice the usual histological tests.

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# INTRA-OCULAR FOREIGN BODIES*

## An account of military cases from the Burma-Assam front

BY

E. J. SOMERSET *and* K. SEN

CALCUTTA

DURING 1944, 1945 and 1946, it was our privilege to operate upon a number of military personnel sent to the Eye Infirmary, Medical College Hospital, Calcutta, from the Indian Military Hospital and the British General Hospital, Calcutta. All but one of the cases described were battle casualties. The cases do not represent an unselected series of casualties. Only those cases showing two criteria were operated on by us. First, there was a retained intra-ocular foreign body, and secondly, at least perception of light with fair projection was present. Those cases in which vision was nil had been previously excluded, as also those cases of penetrating injury of the eye in which the foreign body was extra-ocular, though intra-orbital. It is thus a selected series of 29 cases which we are about to describe.

The most striking way in which these foreign bodies, produced by the fragmentation of modern war missiles, differ from foreign bodies due to the usual hammering and chipping accidents of civilian life, is in their magnetic properties. The former are usually very lowly magnetic while the latter are often highly magnetic. This was also the experience of Stallard (1944) during the North African campaign and during the later battles in France and Belgium : Stallard (1947).

Owing to the nature of the country and the extremely long and difficult line of communication, there was often considerable delay before we saw the cases. However, with the routine administration of the sulpha drugs by mouth at the Regimental Aid Posts, it was gratifying to see how few cases had become seriously infected. In fact, it would seem that it may even be an advantage for the cases to be treated conservatively for a few days, so that the eye can recover its tension before being subjected to operation. It seems that there is less likelihood of secondary haemorrhage if the eye has had several days rest. In any case the foreign bodies, being so lowly magnetic, very accurate localisation is necessary, so that the tip of the magnet may be placed as near to the foreign body as possible. With several weeks delay, however, there is the chance that the foreign body will become bound down by

* Received for publication, June 11, 1947.

inflammatory fibroblastic reaction, so making extraction much more difficult.

There were 15 British cases, and 14 Gurkha and Indian cases. The only clinical difference between them, was that the Indian eye tends to settle down after operation or injury more rapidly than the British. While in the Army, one of us (E. J. S.), noticed the difference in cases in which there had been penetrating injury of the eye. If the eye was not quieting and settling down at the end of 14 days, but remained red, watery and irritable, one began to worry about sympathetic ophthalmitis. At the end of a further 10 days, most of the Indian and Gurkha cases had settled down and gave no further anxiety, while the British cases often continued to remain irritable for a further 10 days and the daily search for k.p. continued. In fact, no case of sympathetic inflammation was seen.

## Missiles

Table A shows the types of missile involved. Almost all gave a history of injury with a Japanese grenade. In most cases it would appear from the history that the explosion had taken place within a few yards of the soldier. All the foreign bodies were small, as might be expected. A large fragment so damages the

TABLE A

| Missile | Number |
|---|---|
| Japanese Grenade ... ... ... | 26 |
| Japanese Mortar ... ... ... | 2 |
| Bomb Accident ... ... ... | 1 |
| Total ... ... ... ... | 29 |

eye that perception of light is lost and the eye disorganised. The foreign body varied in size, from minute fragments less than 1 mm. in any diameter, up to 4·5 x 3 x 1·5 mm.

## Clinical facts

A careful history was taken and minute examination of the eye made, taking care to remember that even if one foreign body

was visible, there might be one or more others in the eye as well. Repeated fundus examination was made in case any foreign body had been missed in earlier examinations.

*Age incidence*—was as in Table B.

TABLE B

| | |
|---|---|
| Less than 20 years ... ... ... ... | 1 |
| 21 to 30 years ... ... ... ... ... | 20 |
| 31 to 40 years ... ... ... ... ... | 8 |

*Site of wound.*—The entry wound was through the cornea in 8 cases, at the limbus in 4, through the ciliary region in 8, through the sclera in 1, and could not be found in 8 cases. (Table C). A very small foreign body may penetrate the conjunctiva and sclera and leave no visible mark of entry. Nine cases were irritable and twenty were quiescent by the time they were sent to us. In only one case were k.p. present. This case refused enucleation and months later the foreign body was removed and he obtained 6/18 vision. The iris was torn or showed a hole in 6 cases, but showed posterior synechia in 7, and anterior synechia in 3 cases. The lens showed some signs of cataract in 14 cases—nearly 50 per cent. Table C shows the relationship between the site of the wound and

TABLE C

| | Number | Associated Cataract |
|---|---|---|
| Through the cornea ... ... | 8 | 7 |
| At the limbus ... ... ... | 4 | 2 |
| Ciliary region ... ... ... | 8 | 3 |
| Not seen ... ... ... | 8 | 2 |
| Sclera ... ... ... ... | 1 | — |
| Total ... ... ... ... | 29 | 14 |

the incidence of cataract. Naturally, corneal wounds show the highest incidence of lens damage.

*Vitreous haemorrhage.*—The incidence of vitreous haemorrhage was very great and was a serious cause of visual defect. In 11 cases the lens opacity prevented examination of the vitreous. Of the remaining 18 cases only 4 showed a clear vitreous while 13 showed haemorrhage which was mostly extensive; one case showed a yellow degenerating vitreous. Table D shows vitreous

TABLE D

Vitreous Haemorrhage in Relation to Wound of Entry

| Vitreous Haemorrhage | Cornea | Limbus | Ciliary Region | Sclera | Not seen | Total |
|---|---|---|---|---|---|---|
| Severe ... | 1 | 1 | 1 | 1 | 4 | 8 |
| Moderate ... | 1 | 1 | 2 | — | 1 | 5 |
| Total ... | 2 | 2 | 3 | 1 | 5 | 13 |

TABLE E

| Vision | Number |
|---|---|
| 6/6 ... ... ... ... ... ... ... ... | 1 |
| 6/12 ... ... ... ... ... ... ... ... | 1 |
| 6/18 to 6/60 ... ... ... ... ... ... ... | 6 |
| 5/60 to 1/60 ... ... ... ... ... ... ... | 1 |
| Counting fingers to hand movements ... ... ... | 6 |
| P of L (good projection) ... ... ... ... ... | 7 |
| P of L (poor projection) ... ... ... ... ... | 7 |
| Total ... ... ... ... ... ... ... ... | 29 |

haemorrhage in relation to the wound of entry. The incidence of vitreous haemorrhage is about 77 per cent, and is much higher than Stallard's cases in the B.L.A. series (44·4 per cent.) and the M.E.F. cases (48 per cent.), and in Scott and Michaelson's cases (1946).

*Vision.*—Vision before operation was as in Table E.

*Tension.*—In only 8 cases was the tension below normal to finger testing while the remaining 21 appeared to have normal tension by the time we saw them. No case showed a rise of tension.

*Retina.*—In 16 cases the retina was not visible on account of cataract or vitreous haemorrhage. In the other 13 cases there appeared to be retinal damage in 10 and 3 were probably normal.

*Multiple Foreign Bodies.*—There were 5 cases of multiple foreign body in the eye. In one case both were removed at one posterior route operation. In the second case of 3 intra-ocular foreign bodies, one came out at operation and two failed to come. This is counted as a failure. In the third case, there were 4 intra-ocular foreign bodies and only one could be extracted. In the fourth case, both foreign bodies failed to come out and in the fifth case, there was one foreign body in the left eye and two in the right. The foreign body failed to come out in the left eye, so no operation was attempted on the right. Posterior route operation was used in all these cases.

## Localisation

Before operation it is always necessary to know the exact position of the foreign body, so that one's incision can be planned accordingly. In 13 cases the foreign body could be seen with the ophthalmoscope. In all the other 16 cases, the ring method of localisation was employed. The method proved extremely accurate. The only disadvantage is that a small minor operation is required to sew the ring to the conjunctiva. The eye is anaesthetised with cocaine 4 per cent. drops and a ring 12 mm. in diameter made of thin silver wire is sewn with four silk sutures so that it accurately fits on the corneo-scleral junction. The sutures pass through the conjunctiva close to the limbus at 12 o'clock, 3 o'clock, 6 o'clock and 9 o'clock. A pad is placed on the eye and the patient taken to the X-ray department where an antero-posterior and lateral film of the orbit is taken. In every case, care is taken that the eyes are in the primary position. If the X-ray tube is 30 inches from the plate, little X-ray distortion of size occurs. The great advantage of this method is that the surgeon can see by looking at the X-ray picture whether the film

has been taken with the eye in the primary position, that is to say, the axis of the eye corresponds to the direction of the X-rays and at right angles to the plane of the film. With perfect centring, the ring will appear as a perfect circle in the antero-posterior view, and as a line in the lateral picture. If the eye has been turned away from the primary position during the exposure, the ring will appear as an oval and further pictures must be taken. The ring seen in the anterior posterior film represents 12 mm. so that it is easy to draw on the film a circle twice the size, *i.e.*, representing 24 mm. diameter which must represent the circumference of the eye at the equator. The distance of the foreign body above or below and to the nasal or temporal side of the central corneal point can now be measured. Magnification of the ring on the film never amounts to more than 1 mm., and can be allowed for. In a similar way the distance of the foreign body behind the central corneal point can be measured from the lateral picture. In this way the foreign body is located in space relation to the central corneal point and so determination is made as to whether it is extra- or intra-ocular and estimation may be made as to the exact point on the sclera which is nearest to the foreign body.

For those cases in which the foreign body is near the sclera, some surgeons use two further pictures; one with the eye rotated up, and the other with the eye looking down. If the foreign body is in the globe, it will be seen to have moved with the eye. As one gets a somewhat similar movement of foreign bodies situated in Tenon's capsule, this added technique does not seem to us to be necessary or reliable. Figs. 1 and 2 show the position of 19 cases localised by X-ray. Of the remainder, one was in the

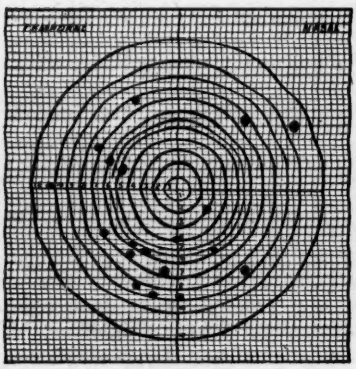

Fig. 1

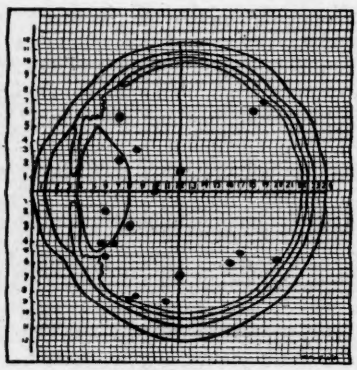

Fig. 2

anterior chamber and 9 were visible with the ophthalmoscope and so no X-ray was taken. How accurate the ring method of localisation can be is shown by the following case:

NAIK J.D.—Showed on examination: right eye vision equals perception of light, projection, nasal and inferior only. The eye was quiet. No wound of entry could be seen. Cornea was normal. Pupil was fully dilated with atropine. The lens was clear. The vitreous was full of blood and no fundus details could be seen. X-ray localisation showed one foreign body 13 mm. posteriorly, 13 mm. to the nasal side and 1 mm. below the horizontal. The foreign body therefore appeared to be outside the sclera, just behind the equator and underneath the internal rectus muscle. At operation the conjunctiva was incised and the internal rectus muscle exposed near the equator of the eye. The foreign body was removed with the tip of the No. 1 electrode of the Mellinger Magnet and was found to be lying under the muscle on the sclera, exactly in the position in which it had been localised.

### Magnet test

This was not of much value. It must of course be done before X-ray localisation. If done afterwards, it may cause the foreign body to take up a new position, thus nullifying the value of the localisation with X-ray. Very seldom was a pull obtained sufficient to cause pain or sensation. The foreign bodies are so lowly magnetic that they will only move slowly and gently to the sclera. If the foreign body is visible with the ophthalmoscope the magnet test will demonstrate whether the foreign body is magnetic or not. In several cases in which the foreign body was seen to move slightly forward towards the magnet on switching on the current, we were unable to manipulate it forwards into the anterior half of the vitreous. Thus anterior route extraction was impossible in many cases. They were subsequently removed by the posterior route. In two cases in which the foreign body was visible with the ophthalmoscope, the magnet test appeared to be negative and yet the foreign bodies were subsequently removed with the magnet by the posterior route.

## Choice of operation

Decision has to be made whether to extract the foreign body *via* the anterior route through a keratome incision in the cornea or, on the other hand, by the posterior route through a small incision in the sclera. In many cases the decision was not difficult as the

foreign bodies being so slightly magnetic it was impossible to draw them forwards to the iris and so through the pupil into the anterior chamber. It was thus essential to place the tip of the magnet as near to the foreign body as possible, so that the posterior route was inevitable. It is sometimes possible to bring a foreign body forwards through the pupil by repeated attempts each day, a procedure which is facilitated by repeatedly switching on and off the magnet some 20 or 30 times, Crawford (1943), Wright (1944). Care must be taken, however, not to overheat the magnet and we did not employ this technique except in those cases in which there was obviously a good chance of success. If we had burnt out our magnet there seemed no chance of repairing or replacing it for perhaps two years, which would have been a disaster.

### Posterior route technique

The eye was anaesthetised with 4 per cent. cocaine drops and a retrobulbar injection of 1·5 c.c. of 2 per cent. novocaine, and akinesia obtained by injecting the facial nerves with 2 per cent. novocaine, using the well-known O'Brien technique. The conjunctiva was incised concentrically with and about 1 cm. behind the limbus in the quadrant of the eye in which the foreign body was situated. The two recti muscles bounding the quadrant were exposed and retraction sutures placed under them. Thus if the foreign body was in the lower nasal quadrant the retraction sutures were placed under the inferior and medial recti. Throughout the operation a "no touch" technique was employed even to manipulating the lids with a swab stick when inserting the speculum. The sclera was cleaned with small swabs. The position of the ora serrata and the equator was marked on the sclera with a solution of methylene blue-gentian violet, applied with a Nettleship's dilator. The position on the sclera nearest to the foreign body was then marked. Five or six points of diathermy barrage were applied round this point, using Larssen's electrode. A fine thread scleral suture was inserted on either side of the marked point on the sclera so that it penetrated only the superficial half of the scleral fibres. The loop was left long so as not to interfere with the next stage. An incision was now made in the sclera with a Graefe knife between the scleral suture (Figure 3). This was usually 3 and never more than 4 mm. in length. The sclera was cut through gradually using repeated strokes so that the choroid was exposed. After this the choroid and retina were incised in a like manner so that the tip of the knife did not penetrate the vitreous. It may sometimes be possible to draw the foreign body through the retina without incising the latter with the knife, but

it is thought that more damage will be done to the retina in this way than that inflicted with the Graefe knife. The Mellinger magnet was then placed round the patient's head which was put in such a position that the incision was uppermost. No. 1 (the smallest) Mellinger electrode was now applied to the lips of the wound and the current switched on. If the foreign body failed to come out, larger electrodes were applied and the current switched on and off repeatedly. This would not always bring the foreign

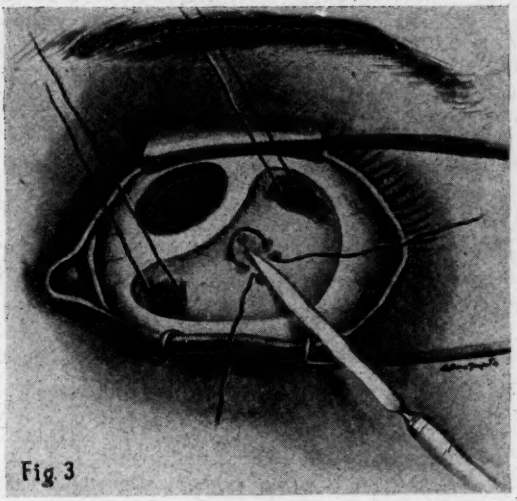

Fig. 3

body out through the wound, in which case the smallest No. 1 electrode was again applied and was sometimes introduced 2 or 3 mm. through the wound. This was only necessitated when the foreign body had got stuck in the retina close to the incision. The scleral suture was then tied and cut short and the conjunctiva sutured.

## Results

Table F shows the results of the operation. In 6 anterior route operations, 5 were successful and one failed to come out. In this case there had been an iris prolapse excised in the forward area and the foreign body was localised to be lying behind the iris near the ciliary body. It proved to be either non-magnetic or bound down by organised fibrous tissue.

In 23 posterior route operations the foreign body was extracted in 17 cases, and in 6 cases it failed to come out. Thus in 29 operations the foreign body was removed in 22 with 7 failures. This gives 75·8 per cent. of extractions. With multiple intraocular foreign bodies, unless all came out the case was recorded as a failure.

TABLE F

| | Jap grenade | Jap mortar | Bomb accident | Total |
|---|---|---|---|---|
| POSTERIOR ROUTE | | | | |
| Magnet extraction ... ... | 14 | 1 | — | 15 |
| *Non-magnetic extraction ... | 2 | — | — | 2 |
| Not extracted... ... ... | 6 | — | — | 6 |
| ANTERIOR ROUTE | | | | |
| Magnetic extraction ... ... | 3 | 1 | 1 | 5 |
| Not extracted.. ... ... | 1 | — | — | 1 |
| Total ... ... ... ... | 26 | 2 | 1 | 29 |

* These foreign bodies came out on incision of the sclera.

In one case of anterior route extraction the eye continued to be irritable and was enucleated. One case, in which there was extensive vitreous haemorrhage, subsequently developed many vitreous bands and detachment of the retina supervened. One case after posterior route extraction developed a detachment of the retina below the area of diathermy barrage which could be clearly seen. In spite of complete rest in bed and stenopaeic goggles the detachment was seen to be extending and so was operated upon successfully, the retina going back into place with retention of 6/6 vision. No case developed a post-operative infection. Most of the cases were only retained in the Eye Infirmary, Calcutta, for about three weeks after operation, so that observation of late visual results was impossible.

*Vision.*—At about 3 to 4 weeks after operation, visual acuity was unaltered in 17 cases. In 8 vision had improved, and in 4 it was worse. These four included one eye which had had perception of

light only and was subsequently enucleated for continued irritation, and one whose vision had fallen from poor projection to nil. The remaining two showed some increase in the vitreous haemorrhage, although diathermy barrage had been used at operation.

**Summary**

A description of 29 cases of intra-ocular foreign bodies mostly from Japanese grenades in the Assam-Burma Front is given.

The low-magnetic properties of the fragments necessitated posterior route extraction in most cases.

Ring X-ray localisation proved very accurate and the Haab test was of little value and often misleading.

The main causes of visual defect were vitreous haemorrhage and cataract.

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## SOLAR RETINITIS*

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IN January, 1943, C. A. Pittar reported a rather unusual case of "hole in the macula" following indirect "sun gazing." The case assumed military as well as medico-legal importance for the pertinent data in the case report indicate that complete loss of vision was "in line of duty." The history obtained from the patient one and one half years after the acquisition revealed the fact that enemy planes had a habit of flying out of the sun, and being in charge of an anti-aircraft gun he had upon several occasions looked into the sun. He could not clearly recall one specific instance when he had gazed into the sun. The patient's record revealed that two years earlier he had had perfectly normal vision in each eye. Another record indicated that at the time of examination for a cinder in his right eye the ophthalmologist had noted "clouding of the macula along with pigmentation and

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haziness." There was at this time almost complete blurring of vision for three weeks' duration and a history of " sun exposure " was recalled.

In reconstructing the picture the following facts seem to stand out :

(*a*) The sailor had had 20/20 vision in each eye.

(*b*) Some time after watching planes fly out of the sun, a central scotoma developed with loss of vision for a period of three weeks. At this same time a cinder was present in the patient's eye.

(*c*) Fundus examination showed a picture typical of " solar retinitis," but it was mis-diagnosed and explained as corneal involvement.

(*d*) One and a half years later a typical macular hole was found in the right eye with vision of 2/60.

The author quotes Duke-Elder and states that no other single reference " of typical hole in the macula due to exposure to sunlight " has been reported. He analyses the three cases cited by Duke-Elder of other authors, *viz.*, Würdemann, Harmon and McDonald and Rauh, showing that these cases are not phototraumatic holes in the macula since they were caused by other elements. Würdemann's case report was not one of eclipse blindness but hole production in the macula in a patient who looked into a welding flash for two to four minutes. This patient was a myopic female (-6·0 dioptres). A typical " Berlin opacity " of the macula was reported along with multiple radial macular haemorrhages. Later the macula developed a greenish cast with a whitish centre. The final appearance was a typical hole in the macula. The author placed emphasis upon the fact that only a few seconds' exposure will destroy the delicate system of nerve elements in the macula. The author also believes the process in sun gazing, electricity, lighting, etc., is very similar. The appearance of this lesion is not unlike that described in our first case, *viz.*, the " yogi sun gazer."

In Harmon and McDonald's case, no true hole in the macula was observed, rather a retinal detachment developed which was subsequently followed by striation and scarring in the macula but not hole formation.

In October, 1943, I had the extreme good fortune to examine a patient who apparently fitted into the pattern described by C. A. Pittar. This patient was a 24-year-old Mexican who stated that he directed his gaze into the sun and maintained fixation constantly for a period of fifteen to twenty-five minutes. He also stated that at first the sun appeared as a complete blur with no visible structure but after a short period its shape could gradually be made out.

For three days following this act, the patient noticed a large round black spot in front of each eye. In time this spot became smaller in diameter and after one week the scotomata continued to maintain a constant size. At present the spots are round upon direct visual localisation.

The patient's vision was 20/100 in each eye and could not be further corrected. The initial fundus examination, which was made about six weeks after this episode, showed each macula to have a peculiar greenish colour with a pigment halo following just around the foveal reflex. Anterior to the foveal depression in each eye was a small whitish grey fluffy area. This looked very much like a " powder puff " being somewhat transparent and allowing a slightly translucent glow when viewed by retro-illumination (method of Friedenwald). This picture was more or less bilaterally symmetrical. When re-examined ten days later the " puffs " had disappeared and each macula had taken on an increasingly darkened area. Five weeks later it was noted that a definite hole had appeared in each macula. These holes were rather small yet cleanly punched out and girdled by a pigment halo. In another two weeks each hole appeared oval horizontally with a pronounced pigmentary ring. There was little change in this picture in the next six weeks.

While obtaining the patient's history I had casually mentioned to one of the medical men that " sun gazing " was frequently practised in India as a religious ritual. I asked the patient if he had ever practised yogyism. This he denied. Sometime later I read the following in Elliot's Tropical Ophthalmology :

" Sun-blindness, with macular degeneration, is not uncommonly met with, and the ophthalmoscopic picture is quite characteristic. The macula forms a crater of deep crimson colour, 1/8 disc diameter in width, the edges of which are sharply cut and irregular in shape; it is surrounded by a soft cloud of pigment.

" In this connection, it is interesting to note that it is part of the Brahmin ritual to look at the sun whilst reciting a particular ' mantram ' during the mid-day prayer. The practice is to fold the fingers in a peculiar manner, and look at the sun through the interspaces. The orthodox fashion of dodging the fingers leaves an aperture of about an inch square, but it seems that all Brahmins are not equally particular as to the manner of folding the hands; indeed, some of them do not even go outside the house to perform the rite, but are content to take the presence of the sun for granted, and merely to address the light. The mantram itself only takes three or four seconds to recite but one may imagine that the tropical sun, if looked at directly, is capable of doing damage, even in this short space of time. In some places it appears to be

the custom to look at the rising sun directly, without the intervention of the fingers, and in such a case the time may be extended to four or five minutes. It is remarkable that this disease is by no means confined to Brahmins; indeed those who are not Brahmins have furnished the majority of the patients. The probable explanation is that this practice, having a religious sanction, is followed by men of other castes, and that these imitators are inclined to carry it to excess; it is sometimes considered to be "lucky" and to confer supernatural powers. This idea most likely originates in the extensive use of self-hypnotism by "yogis," who, for this purpose, are in the habit of fixing a sustained gaze on some bright object, or of using their eyes in some manner which entails a fatigue of the ocular muscles. Thus a common yogi habit is to gaze at the tip of the nose or at the eyebrows, the power of sustained over-convergence, which they thus acquire, is, in some cases, astonishing. Sun-gazing in the morning and evening appears to be one of the methods of self-hypnotism. Amongst the less zealous worshippers the disease is often monocular, as some, at least, of them appear to have a doubt as to the wisdom of tampering with such things, and, tempering their zeal with discretion, risk the sight of one eye only. On the whole it is extraordinary that sun-blindness is not more common than it is."

In October, 1943, L. Pavia and Lachman described two cases of very small holes in the maculae due to photo-traumatism. These authors describe three types of "solar" injury and they show three fundus photographs with typical macular holes. One case was unilateral, the second bilateral. In each case the history was typical, *i.e.*, an eclipse was observed with no apparent protective measures. There was sudden loss of vision with gradual restoration after a period of days—but not complete restoration. The patients were not examined until several years later, at which time typical macular holes were found. The unilateral case was complicated by an endocrine dysfunction.

Pavia and Lachman review the literature and state that most authors stress the oedema, clouding and pigmentation which occur in the macula with little emphasis being placed upon the final macular picture. Animal experimentation was quoted to show the nature of the pathological lesion in the macula concerning which changes some controversial opinions had arisen. However, in the last analysis the anatomical difference of man and animal, particularly in the macular region, was stressed.

The human experiments of Maggiore did not enlighten the picture very much either, since this author used primarily an artificial light source at a very near distance. In conclusion,

Pavia and Lachman emphasise the patient's refraction; the distance of the source of light; the intensity of the light and the interval of time before examination to explain the occurrence of the small macular holes.

In the past year I have had occasion to observe a great many cases, during routine examination, which showed these small, easily overlooked macular holes. When discovered I have checked back upon the patient's history, trying not to ask leading questions and in all cases I have elicited a history of " sun-gazing " or a related act. In most instances these patients recall with facility all the events accompanying the act of sun-gazing. A prepared table includes many of the methods and some of the protective procedures followed by these patients.

Review of these cases seems to indicate that many patients recall gazing into an eclipse through self smoked glasses. In many cases one eye was covered for protection. The macular holes were of a very small variety. In some instances the method of development was rather peculiar, such as gazing into a stream of water, a water pail or looking through a self-made stenopaeic slit. The time interval varied from five minutes to an hour and a half. One patient believed that the eye became strong through gazing into the sun. He had come to believe through folk lore or some local teaching, that to become " eagle eyed " one must gaze into the sun even as the eagle does. In other cases the patient stated that he along with other boys gazed into the sun for several minutes and that many of those in this same group suffered from similar ocular troubles years later. One patient (No. 12) not only looked at the sun through smoked glasses for several minutes but also used to study the sun through a telescope. His cousin also had an eye complaint very much like his and had sought ocular aid without benefit.

In 1944, H. E. Smith reviewed 150 cases in military personnel stationed in a tropical country. These were men whose visual acuity had been previously recorded by this same observer. They were subsequently exposed to tropical sun, working out doors, etc. After a period of six months it was noted that these men had fallen in vision from 20/20 to 20/30 and that this vision could not be improved through refraction. The author noted that in each case the fundus lesion was more or less typical regarding macular disturbance. He described three fundus patterns which were very constant. Smith pointed out that these men worked at all times in the bright sunlight—being unprotected from glare and for the most part not used to this strength of sunlight. The author did not discuss the pigmentation of these men, nor the prophylactic measures taken against the strong sun nor the subsequent and

| No. | Initials | Age | Vision O.D. | Vision O.S. | Type of Exposure | No. yrs. ago | Protection | RX | Nerve | Macula | Retina |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | P. ... | 22 | 20/100 | 20/100 | Constant sun gazing 15-25 min. | 2 mths. | None | — | — | Hole | Neg. hole |
| 2 | C. ... | 26 | 20/100 | 20/20 | Sun gazing for several min. | 13 yrs. | Smoked glasses | — | Norm. | Hole | Neg. |
| 3 | J. J. ... | 20 | 20/200 | 20/100 | Watched sun in a " water bucket " | 15 yrs. | None ; no eye closure | + 1·50<br>+ 1·50 | Neg. | Holes | Neg. |
| 4 | H. W. ... | 24 | 10/200 | 20/50 | Watched sun for 1 hr. | 7 yrs. | None | — | Neg. | Hole | Neg. |
| 5 | V. H. ... | 25 | 20/20 | 20/100 | Watched sun for 1½ hrs. | 5 yrs. | Doesn't recall events | + 1·00<br>+ 1·00 | Neg. | Double Hole | Neg. |
| 6 | S. C. ... | 25 | 20/20 | 20/100 | Watched sun for ½ hr. | 14 yrs. | Closed left eye | — | Neg. | Hole | Neg. |
| 7 | J. T. ... | 36 | 20/70 | 20/100 | Watched sun for ½ hr. | 20 yrs. | Closed right eye | — | Neg. | Hole | Neg. |
| 8 | J. L. ... | 22 | 20/20 | 20/20 | Watched eclipse for 3 min. | 6 yrs. | None | — | Neg. | Hole (small) | Neg. |
| 9 | S. C. ... | 26 | 20/40 | 20/40 | — | 6 mths. | None | — | Neg. | Hole | Neg. |
| 10 | R. M. ... | 25 | 20/40 | 20/30 | Sun gazing for 15 min. | 15 yrs. | Covered left eye | — 0·25 | Neg. | Hole (small) | Neg. |
| 11 | A. S. ... | 23 | 8/200 | 20/20 | Gazed at sun 3-5 min. | 15 yrs. | None | — | — | Pigment around macula — small hole | — |
| 12 | M. ... | 21 | 20/200 | 20/30 | Gazed at eclipse 15 min. | 2 yrs. | Smoked glass | + 0·25<br>+ 0·25 | Neg. | Hole | Neg |
| 13 | A. ... | 26 | 20/30 | 20/30 | Looked into stream many min. | 6 yrs. | None | — | Neg. | Hole | Neg. |
| 14 | D. ... | 29 | 20/30 | 20/70 | Sun gazing 1 hr. | 8 yrs. | None | + 0·75<br>+ 0·50 | Neg. | Holes | Neg. |
| 15 | J. B. ... | 28 | 20/70 | 20/20 | Sun gazing in stream (eclipse) | 9 yrs. | None | + 1·25<br>+ 1·25 | Neg. | Hole | Neg. |
| 16 | C. E. ... | 33 | 20/20 | 20/20 | Sun gazing for 5 min. | 12 yrs. | Closed left eye, smoked glass | — | Neg. | Hole | Neg. |
| 17 | J. P. ... | 27 | L.P. | 20/20 | Sun gazing for 30 min. | 12 yrs. | None | — | Neg. | Hole | Neg. |
| 18 | G. S. ... | 23 | L.P. | 20/30 | Sun gazing for 45 min. | 10 yrs. | Closed O.S. | — | Neg. | Hole | Neg. |
| 19 | T. G. ... | 24 | 20/180 | 20/60 | Watched eclipse for 15 min | 14 yrs. | None | — 4·00<br>— 4·00 | Neg. | Seg. & hole O.D. | Neg. |
| 20 | H. H. ... | 23 | 20/25 | 20/20 | Watched sun for 15 min. | 12 yrs. | Small hole in cardboard. Cov. O.S. | — | Neg. | Hole (small) | Neg. |
| 21 | H. ... | 24 | 20/70 | 20/20 | Watched sun for 4-5 min. | 15 yrs. | None | — | Neg. | 2 small holes | Neg. |
| 22 | M. H. ... | — | 20/40 | 20/25 | Gazed on reflecting white surface several mins. | 8 mths. | None | — | Neg. | Small biconvex hole | Neg. |
| 23 | G. ... | 24 | 20/70 | 20/25 | Watched eclipse 5 min. | 1½ yrs. | Through opening in hand | — | Neg. | Bilateral holes | — |

final course of the macular lesion (probably as yet too early). However, these case reports seem to bridge the gap between the many descriptions of the acute oedema following eclipse blindness and the ultimate small macular holes found many years later. Since the condition is far from rare and since the problem is largely one of prevention, it is urged that this subject be placed before many who are unaware of the dangers of "sun-gazing." That the danger is not recognised by ophthalmologist as well as by the unsuspecting sun worshipper may be readily realised when one quotes directly from Troncoso's text book upon Internal Diseases of the Eye and Atlas of Ophthalmoscopy (page 382).

"The use of smoked glasses during sun eclipses will prevent injury to the retina."

Case 23 is an excellent example of the medico-legal importance of this condition. This man had vision of 20/20 in each eye at the induction examination. One and a half years ago while he was stationed in Alaska he gazed at an eclipse for five minutes through a small opening made by his own hand. He used one eye and then the other. There were no immediate after effects. At present his vision is 20/70 in his right and 20/50 in his left. There are holes in each macula to correspond with the vision of each eye. The causal relationship seems quite clear in this case. The problem of education along preventive medical lines seems almost as glaring.

### Report of cases

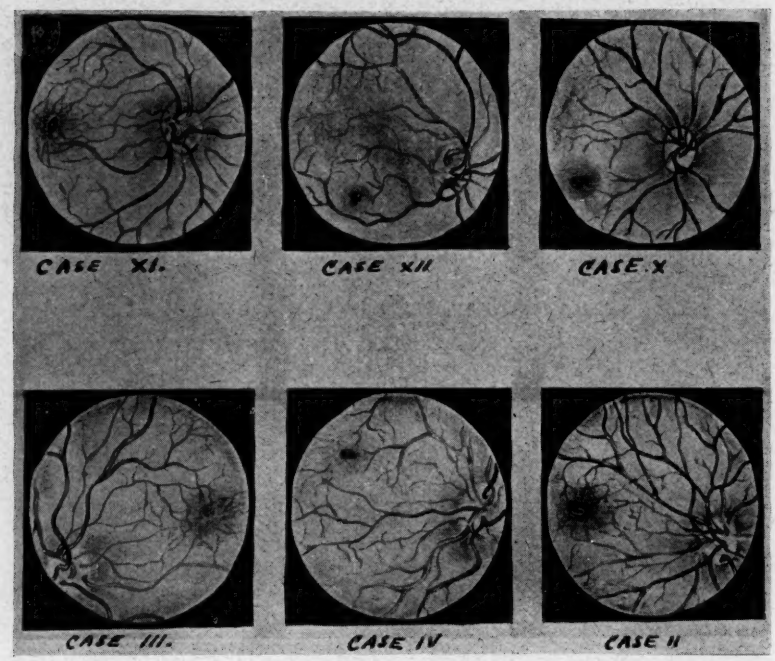
CASE 1.—The patient is the above-mentioned Mexican, aged 24 years, who gazed constantly at the sun for a period of 15 to 20 minutes and developed the several changes which we followed and described in an earlier paragraph.

CASE 2.—This is the case of a soldier, aged 26 years, whose vision was 20/100 in the right eye and 20/20 in the left eye, no improvement being obtained upon refraction. In the right macula a very small "kidney bean" hole was present with the long axis lying horizontal, and a lighter halo surrounding the small hole. There was some increased pigmentation beyond this point. The nerve head and fundus otherwise was normal, as was the fundus of the left eye. The patient recalled that thirteen years earlier he had observed an eclipse at which time he had smoked a piece of glass and had gazed intently at the sun while keeping his left eye closed. When he returned for a second examination he was able to recall that his right eye had remained blurred for a few days following the "sun gazing." At first quite a definite golden ball was present, but this gradually disappeared, although not completely. He had done nothing about this condition and had never connected his poor central vision in his right eye with this episode of sun gazing. He knows that although he is right handed, he has learned to use his left eye as his dominant one.

CASE 3.—This patient, J.E.J., aged 20 years, stated that when he was six or seven years old he had watched the structure of the sun through reflection into a bucket of water as part of a religious ritual. He does not remember how long he gazed into the bucket of water nor how long his eyes were troubled as a result of this procedure, but he does remember that he had a good deal of discomfort following this episode. He had had his vision checked at school upon many occasions, but had never been given any glasses. The right fundus showed a

tiny hole in the foveal area, quite dark, undermined and horizontally elongated. The hole in the left macula was slightly smaller, also horizontally elongated with a surrounding pigment halo and two small dots of yellowish colour at its centre. (Case 3.) The retinae otherwise were negative. Central fields showed two small absolute scotomata corresponding in size and shape to the original lesion.

CASE 4.—This soldier, aged 24 years, recalls watching an eclipse without any protective mechanism other than self-smoked glasses for a period close to one hour when he was 17 years of age. He well remembers the after-effects, for he was unable to read print for three or four days because of a constant dazzle in front

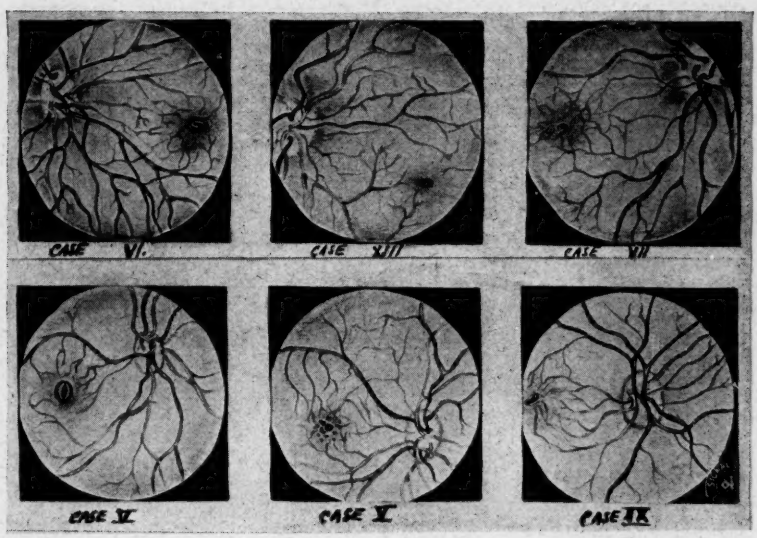



of his eyes during this period. This effect gradually disappeared at the end of one week, although his right eye thereafter seemed to have a permanent blank area when looking straight ahead. He did not have this condition investigated at the onset, although he tried later to secure glasses without benefit. Examination of the fundi showed a small macular hole in each eye very similar to the "hole" seen in Case 3. Here also were two small round yellowish spots at the base of the hole which ran in a horizontal plane and had a small yellowish lighter halo about the very dark red punched-out centre. The right macular hole was somewhat larger and more oval than the left hole. Vision in this patient's right eye was 20/400 and in the left eye was 20/50, uncorrectable.

CASE 5.—This male, aged 25 years, had vision of 20/100 in the right eye and 20/20 in his left eye, not improved with glasses. On checking the patient's history he was able to recall watching a sun eclipse through self-smoked glasses for a period well over an hour, during which time he remembered keeping his left eye closed. He doesn't remember the exact effect this had upon his eyes other than

that he was very uncomfortable for several days thereafter. He had completely forgotten this experience, and in no way did he connect it with his poor vision in the right eye. Examination of the fundus of the left eye was not abnormal; that of the right showed a peculiarly shaped spindle-like hole with a dark symmetrical ring around the spindle. Increased pigmentation could be seen around this area. The fundus otherwise was negative. A central defect corresponding to this hole in shape and position was mapped out upon the tangent screen.

CASE 6.—T.J., a male, aged 36 years, had vision of 20/70 in his right eye correctible to 20/20 and 20/100 in his left eye—uncorrectable. Twenty years earlier he had watched an eclipse for a period of one hour and at that time




distinctly remembers closing his right eye. He believes he gazed at the sun for a period of one-half hour and that for several days thereafter his vision was quite blurred, remaining that way. The right fundus showed no abnormality. The left fundus presented a characteristic macular lesion consisting of a minute macular retort-like lesion running horizontally and being surrounded by a definitely lighter halo outside which was an area of increased pigmentation extending for a distance equivalent to one disc in diameter.

CASE 7.—Although this male, aged 22 years, had vision of 20/20 in each eye, yet a very tiny hole was discovered in his right eye. He recalls gazing into an eclipse when he was about 12 years old. He believes his left eye was covered at the time, but doesn't recall that he used any protective method. At most he believes his gaze was directed toward the sun for a period of three minutes. He was not aware of any after images or immediate visual disturbance. Examination of his right fundus disclosed a very small dark red macular lesion, more or less oval in shape with two small yellow dots within its centre. There was a slight suggestion of a halo around the hole and a small zone of increased pigmentation. The left fundus was normal.

CASE 8.—This adult, aged 26 years, had vision of 20/40 in each eye which could not be improved. Examination of his fundi showed bilateral hole formation, the right eye being multiple (Fig. 5, Case 8), the left eye being single, obliquely oval

and heavily pigmented. Fig. 5 shows the right macular lesion consisting of three very tiny separate holes, one being crescentic, one being circular and the third being very small and shaped like a figure 8. The retina between the holes was very shiny and almost silvery. The central lesions were surrounded by a circle of small pin point dots, with the area showing increased pigmentation. The crescentic lesion appeared deepest; the circular lesion had a yellowish centre. No history of sun gazing or eclipse viewing could be obtained from this patient who insisted that he had developed his eye trouble while upon desert manoeuvres during the past six months during which time he had been troubled by the reflection of the sun from the desert sand.

CASE 9.—This patient, aged 25 years, gave a definite history of gazing into the sun at the age of eleven for a period of fifteen minutes, his left eye being closed and his right eye viewing the sun through a smoked glass. There was a definite visual aftermath, although the patient doesn't remember any of the details. At present vision is 20/40 in his right eye and 20/30 in his left eye in which eye vision can be corrected to 20/20. The right macula shows a very small "banana" shaped hole with two polar yellow dots and a discrete circum-macular halo. The central field showed a very minute defect corresponding to this macular lesion.

CASE 10.—The patient stated that vision in his right eye was poor as long as he can remember. Vision in this eye is 8/200, in the left eye 20/20. Upon further questioning he admitted that when he was seven years of age he had observed an eclipse without protecting his eyes. He believes that he watched the phenomenon for at least five minutes. However, he cannot describe any subsequent ocular symptoms. The left fundus appeared to be perfectly normal. The right fundus showed a small hour glass, punched out, dark macular hole with two small round yellowish dots. There was no halo around this lesion although there was an area of increased pigmentation extending about the macular lesion as large as one disc's diameter.

CASE 11.—U.A., aged 26 years, had vision of 20/30 in each eye. About six years ago he had carefully studied "sun spots" by gazing into a stream steadily for several minutes. His vision following this procedure has not been as good as it was prior to this experiment. He had tried to secure glasses to correct this visual defect on several occasions but was never fitted satisfactorily. Case 11 shows a typical macular lesion shaped like a spindle running in the vertical direction with a small whitish-yellow dot in the centre. The lesion is typically punched out and is surrounded by a girdle of very small dark dots along with an included area of increased pigmentation. The left eye is very similar to this right eye. There is no other fundus pathology. The central fields show typical central scotomata.

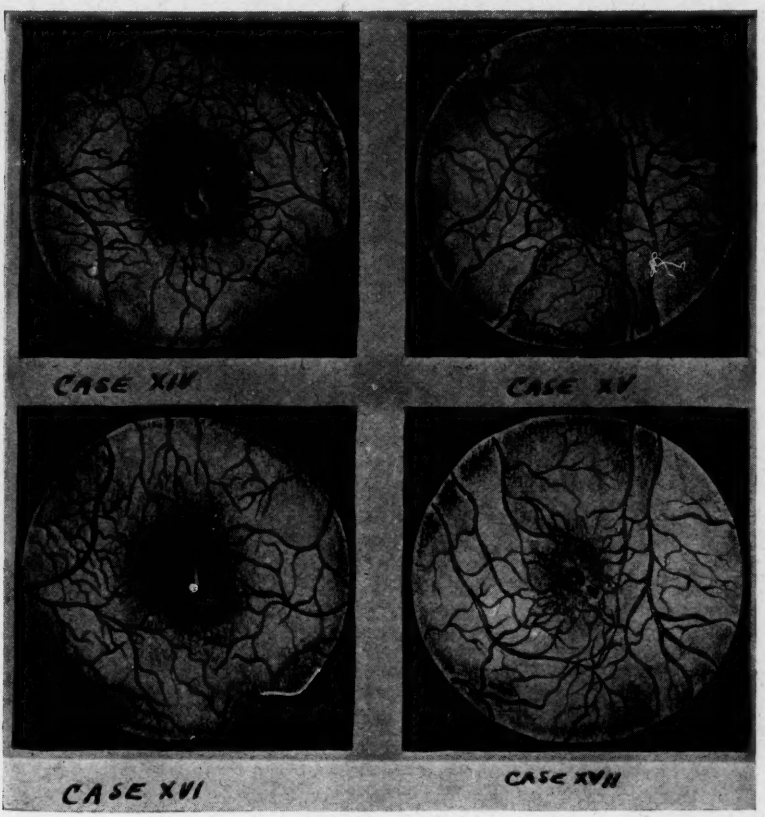
CASE 12.—This patient, aged 21 years, had vision of 20/200 in his right eye and 20/30 in his left eye. When he was eighteen years of age he had watched an eclipse both through smoked glasses and through a telescope in an endeavour to study the phenomenon. In watching the sun a smoked glass was used over his eye as well as over the telescope. The history of visual disturbance following this procedure was very precise; in fact, the patient knows that others who viewed the eclipse through this telescope also have developed some form of "eye trouble." The right fundus shows a very definite hole made up of two components as shown in the illustration Case 12. This hole is not dark red, but has a definite punched-out appearance along with an area of increased pigmentation. The left fundus is normal.

CASE 13.—This soldier, aged 29 years, recalls gazing at an eclipse when 21 years of age, using both eyes with no manner of protection other than carbon deposition upon a broken piece of glass. Again the exact time interval is not known, but it is the patient's belief that possibly a whole hour was consumed in this nefarious procedure. Visual impairment was immediate and definite, and at present is 20/30 in the right eye and 20/70 in the left eye, no further improvement being obtainable. There is only a slight hyperopic correction in each eye. Although there is a marked visual difference in each eye, the lesions in each macula are fairly similar: The figure, Case 13, illustrates the appearance of the lesion in the left eye which is very similar to the lesion depicted in Case 7.

CASE 14.—This patient observed an eclipse of the sun by gazing into a stream

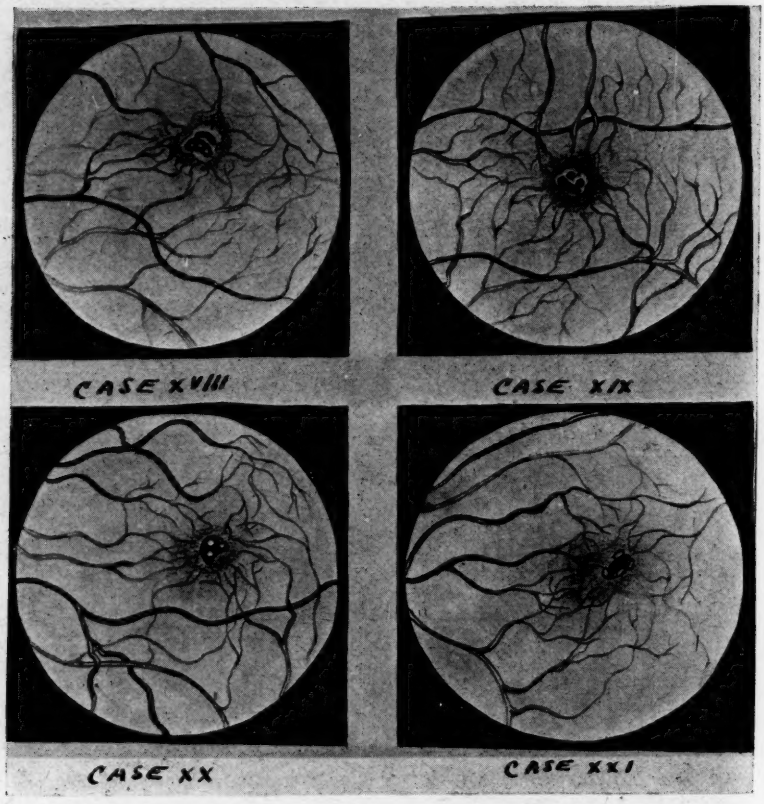
when he was 19 years old. This incident occurred nine years ago at which time no smoked glass or other device was used. Both eyes were kept open during the phenomenon, which lasted some five minutes, and was completely observed by the patient. This was followed by bilateral central scotomata which persisted for several days and gradually but incompletely disappeared. No medical aid was sought, for vision returned to its present status of 20/30 right, and 20/70 left, no further improvement being secured through attempted refraction. The hole in the left eye is illustrated in Fig., Case 14. There is a vertical, rather minute, punched-out hole shaped like an italic letter ( o ), surrounded by a very definite lighter halo, and an area of markedly increased pigmentation. A very definite central scotoma is present in each eye.

CASE 15.—This patient, C.E., aged 33 years, recalls gazing at an eclipse 12 years ago through a self-smoked glass while keeping his left eye closed. After five minutes he discontinued the process. He noticed that a blur persisted in front of his right eye which did not vanish, although it became much less intense after several days. He was particularly annoyed while sighting through a rifle, noting that he could sight much better slightly off centre. These symptoms have persisted ever since. Examination of the right macula showed an inverted heart shaped lesion with a halo around it, and area of increased pigmentation around



the foveolar area. There was a small central scotoma in this eye. The fundus of the left eye was quite normal.

CASE 16.—J.P., aged 15 years, had gazed upon a sun eclipse for fully twenty minutes through his right eye with no form of protective glass. There was immediate loss of vision which persisted for several days, gradually clearing somewhat, but remaining approximately 20/400, although the patient claimed he could see nothing more than large objects with his right eye. There were no signs or symptoms referable to his left eye. Examination of the right fundus




showed a moderately large, dark hole shaped like a hammer head and running vertically. It, too, was surrounded by a halo of lighter than normal retinal tissue, along with an area of increased pigmentation which occupied a region as large as one disc's diameter. There was a large central scotoma to correspond with the macular defect.

CASE 17.—When this soldier, aged 23 years, was 13 years old, he had watched an eclipse with his right eye for a period close to half an hour, keeping his left eye closed, and not using any protective method over his right eye. Vision at present was 20/400 in the right eye and 20/30 in his left eye. Although a

disturbing after-image existed after this experience, the patient had never investigated the cause of his visual impairment, just disregarding vision in his right eye and using his left for central fixation. Examination of the right fundus showed a comma shaped small hole of punched out character with a series of three conjoined smaller holes lying just nasally and below. There was no pronounced halo or depigmentation phenomenon.

CASES 18, 19, 20 and 21 are all cases of gazing into an eclipse at approximately 12—15 years of age, closing one eye and looking through self-smoked glasses. Case 20 varied the procedure by gazing through a stenopaic slit in a cardboard. The time interval of exposure varied from five to twenty minutes. The macular lesions consisted of small polymorphous and multiple holes, surrounded by a halo and containing small yellowish central spots within the holes. In each case the story was the same—an eclipse was viewed through self-smoked glasses, keeping one eye closed and becoming aware of a distinct visual disturbance subsequently, which for one reason or another was not investigated or explained.

CASE 22.—This soldier had lived in Idaho all his life and he was able to recall several "bouts" of so-called snow-blindness, which he experienced in his early childhood. These were bilateral, acute episodes, associated with excessive photophobia, tearing and smarting, which usually lasted for several days during which time the patient was unable to see very well. He had regarded these attacks as typical cases of snow-blindness and thought very little about them. He also recalled many instances in his early life of watching the sun and viewing an eclipse through smoked glasses, although he is not very familiar with any symptoms which may have followed these experiences. There were many occasions, too, in which he had exposed his eyes to the direct rays of the acetylene welding torch, but cannot remember that any harm was produced by such an act. Upon induction his vision was found to be 20/20 in each eye. About eight months ago while in Alaska and while working outdoors he fixed his gaze upon a reflecting white surface for several minutes, and thereafter experienced an after-image of golden yellow in each eye which persisted for more than a week and was associated with intense tearing, blepharospasm and burning. At first he thought these symptoms were similar to those he had experienced in his early youth in Idaho, but when these symptoms left a permanent defect in his vision he felt that something further had developed. He did not seek aid until his return to the United States about one month ago, at which time his fundi revealed bilateral typical macular holes of small calibre with surrounding halos. Vision in the right eye was 20/40 and in the left eye 20/25. The hole in the right eye resembled the map of India in shape, that of the left eye was much smaller. Scotomata were present in both eyes. In the right eye besides a central lesion there was a pronounced downward elongation of the blind spot.

Since writing the above paper an excellent article has appeared by D. O. Harrington in the American Journal of Ophthalmology (Vol. XXIX, No. 11, November, 1946, p. 1405) on "the autonomic nervous system in eye disease," in which the subject of "solar retinitis" is taken up. This author concludes that cases of this sort are unusual and that "these lesions are thought to be the results of localised vasospasm of retinal arterioles and capillaries in the macula initiated by thermal or infra-red rays and terminating in a small hole." From his conclusions I believe Harrington indicates that this end result is part of the clinical picture of a "vaso-neurotic diathesis in an autonomically unstable person." To this conclusion I would like to add just one fact—namely that I have observed over 500 cases of these small macular holes in "coloured" troops, none of whom were vaso-neurotic and everyone of whom was exposed to the direct action of the sun's rays.

# ON RESULTS OBTAINED BY TOTAL CONJUNCTIVAL HOODING OF THE CORNEA FOR SERPIGINOUS ULCER

BY

Prof. A. KETTESY

DEBRECEN

IT is more than 5 years since I introduced a new surgical proceeding for treatment of serpiginous ulcer. The results are so satisfying, that it seems to be worth while to call attention to it.

The operation was devised in 1927 for a case of intractable Mooren's ulcer, and published in 1933, having healed three cases of this so far incurable disease.

The proceeding consists of covering the whole cornea by a conjunctival flap, instillation of cocaine and subconjunctival injection of novocaine and adrenalin in order to raise the bulbar conjunctiva. The bulbar conjunctiva is detached by circumcising it all around the limbus. It is undermined into the upper fornix.

After having scraped the ulcerated parts of the cornea with a Meyhöfer spoon, the round hole in the conjunctiva is united by "anchoring" cat-gut sutures in an almost horizontal line below the cornea.

"Anchoring" means the sutures take up some episcleral tissue. We put in the first suture at 6 o'clock. After having passed the needle through the upper conjunctival edge, we grasp the inferior rectus (in order to fix the eye-ball), then take up some episcleral tissue horizontally 3 mm. below the cornea and bring the suture out through the lower edge of the conjunctiva. It is advisable to use a corneal needle. Thus the line of suture is fixed below the cornea, an important condition of the success, as this is the only way to ensure against spontaneous reopening of the wound.

In cases of Mooren's ulcer the cornea remained covered one year. Then a little hole was made into the middle, behind which the clear cornea reappeared and the patient could see again.

I was led to this solution by the inefficacy of Kuhnt's partial conjunctivo-plasty. The partial hooding always retracts too quickly before a firm coalescence between conjunctiva and flap could have taken place. The ulcerated margin reappears in a few weeks and the disease progresses further.

One of my assistant-surgeons seeing the satisfying results of Mooren's ulcers, proposed in 1940 to try the proceeding in refractory

cases of serpiginous ulcer too. Two years later we were able to publish already the results of 25 cases. Since that time this proceeding is a systematic method of my clinic. As far as I know, it has not yet been accepted elsewhere, except by Lawaetz, who reported 6 successful cases in the Danish Ophthalmological Society in the year 1943. Although Meisner mentions it in the recent German text-book of ophthalmic surgery edited by Thiel (1942, p. 242), there are misunderstandings in the text as well as in the figure and it is evident that he has never tried it.

In the numerous publications on serpiginous ulcer since that time I could not find any other reference to this procedure. What I cannot find surprising is the serious objections quoted against it. *Ubi pus, ibi evacua,* says the old rule, and we act plainly contrarily. Every further treatment, even the control of the ulcer is made impossible by the covering, and—if only temporarily—we deprive the eye of its remaining small vision, creating at the same time a disadvantageous situation from the cosmetic point of view.

We can set against all these drawbacks one advantage, the saving of an eye, or rather, the saving of vision, that would have been lost by any other treatment. Of course it would outdo all objections, if this could be proved.

There are only two particulars that can be made subjects of enquiry; the visual acuity before and after treatment, and the duration of medical attendance, expressed in the days of hospitalisation.

The total hooding is superior to our own medical treatment. Further comparisons cannot be made on the simple ground that in the whole ophthalmological literature there do not exist records or statistics on serpiginous ulcer comparable to ours.

Our medical (conservative) treatment is the well known general treatment of serpiginous ulcer, always adapted to the case. It consists of heteroprotein injections, administration of sulphonamides, instillation of zinc sulphate, optochin, silver compounds, atropine, and the well known treatment of Eperon, *i.e.*, painting the ulcer and its advancing margins with 20 per cent. zinc sulphate solution. An infected lacrimal sac is removed. For hypopyon, paracentesis of the cornea is done. Of course we used largely all propositions available in our 30 years of practice, *i.e.*, various forms of cauteries, iontophoresis, trepanation of Sondermann, chemotherapeutics as rivanol, trypoflavin, vetol, etc., without any convincing success.

As we have to-date 56 cases treated by full conjunctival hooding, in the following tables we compare these with twice 56 cases of the preceding period treated conservatively in the described manner. The basis of comparison is visual acuity and hospitalisation.

## TABLE I

Fifty-six cases of serpiginous ulcer treated conservatively during the period 1935, 6 April—1938, 4 April.

| Number | V at beginning | V at end | Days of treatment |
|---|---|---|---|
| 1 | 0 | 0 | 15 |
| 2 | 0·1 | 0·1 | 10 |
| 3 | 0·1 | 0 | 25 |
| 4 | 12 | 20 | 8 |
| 5 | 0·1 | 0·1 | 7 |
| 6 | 0·1 | 0·1 | 24 |
| 7 | 2 | 2 | 10 |
| 8 | 0 | 0 | 24 |
| 9 | 0·1 | 0·1 | 9 |
| 10 | 1 | 1 | 11 |
| 11 | 30 | 30 | 10 |
| 12 | 12 | 12 | 7 |
| 13 | 0·1 | 0·1 | 15 |
| 14 | 20 | 20 | 8 |
| 15 | 0·1 | 10 | 8 |
| 16 | 0·1 | 0·1 | 15 |
| 17 | 6 | 25 | 19 |
| 18 | 1 | 15 | 16 |
| 19 | 0·2 | 0·2 | 17 |
| 20 | 0·1 | 40 | 7 |
| 21 | 0·1 | 6 | 7 |
| 22 | 0·1 | 0·1 | 15 |
| 23 | 0 | 0 | 13 |
| 24 | 0·1 | 0 | 32 |
| 25 | 0·2 | 0·1 | 6 |
| 26 | 1 | 0 | 8 |
| 27 | 6 | 15 | 4 |
| 28 | 0 | 0 | 20 |
| 29 | 0·1 | 0 | 20 |
| 30 | 0·1 | 0·2 | 23 |
| 31 | 0·2 | 4 | 7 |
| 32 | 0·1 | 0·2 | 11 |
| 33 | 0 | 0 | 27 |
| 34 | 0·1 | 0 | 22 |
| 35 | 0·1 | 1 | 10 |
| 36 | 1 | 1 | 7 |
| 37 | 3 | 12 | 10 |
| 38 | 6 | 12 | 12 |
| 39 | 15 | 15 | 9 |
| 40 | 2 | 10 | 5 |
| 41 | 0·1 | 0·2 | 9 |
| 42 | 0·1 | 0·1 | 11 |
| 43 | 0·1 | 0·1 | 14 |
| 44 | 0·2 | 20 | 10 |
| 45 | 0·1 | 0·1 | 19 |
| 46 | 20 | 25 | 12 |
| 47 | 6 | 1 | 18 |
| 48 | 4 | 10 | 10 |
| 49 | 1 | 15 | 9 |
| 50 | 3 | 15 | 12 |
| 51 | 5 | 8 | 5 |
| 52 | 3 | 6 | 16 |
| 53 | 2 | 5 | 8 |
| 54 | 0·1 | 3 | 6 |
| 55 | 20 | 40 | 87 |
| 56 | 0·1 | 0·1 | 24 |

TABLE II

Fifty-six cases of serpiginous ulcer treated conservatively during the period 1938, 6 April—1943, 10 August.

| Number | V at beginning | V at end | Days of treatment |
|---|---|---|---|
| 1 | 0·1 | 8 | 22 |
| 2 | 3 | 15 | 48 |
| 3 | 0 | 0 | 10 |
| 4 | 1 | 15 | 4 |
| 5 | 1 | 2 | 17 |
| 6 | 0 | 0 | 29 |
| 7 | 0·1 | 0·1 | 28 |
| 8 | 0·1 | 0 | 23 |
| 9 | 0·1 | 0 | 27 |
| 10 | 0·1 | 0·1 | 12 |
| 11 | 0·2 | 12 | 8 |
| 12 | 0·2 | 15 | 7 |
| 13 | 0·1 | 0·1 | 27 |
| 14 | 1 | 10 | 9 |
| 15 | 0·1 | 0·1 | 27 |
| 16 | 6 | 8 | 6 |
| 17 | 0·2 | 2 | 19 |
| 18 | 0·1 | 1 | 27 |
| 19 | 0·1 | 0·1 | 7 |
| 20 | 2 | 4 | 10 |
| 21 | 0·1 | 0·1 | 22 |
| 22 | 0·1 | 0·1 | 21 |
| 23 | 0·1 | 1 | 9 |
| 24 | 0·1 | 15 | 5 |
| 25 | 0·1 | 0·1 | 18 |
| 26 | 1 | 1 | 6 |
| 27 | 0·1 | 2 | 6 |
| 28 | 1 | 1 | 13 |
| 29 | 0·1 | 0·1 | 11 |
| 30 | 6 | 6 | 6 |
| 31 | 0·1 | 0·1 | 11 |
| 32 | 0·1 | 0·1 | 23 |
| 33 | 0·1 | 0·1 | 28 |
| 34 | 0·1 | 0·1 | 10 |
| 35 | 0·1 | 5 | 8 |
| 36 | 0·1 | 0·1 | 12 |
| 37 | 0·2 | 25 | 11 |
| 38 | 0·2 | 0·1 | 18 |
| 39 | 0·2 | 6 | 6 |
| 40 | 0·1 | 8 | 10 |
| 41 | 0·1 | 12 | 11 |
| 42 | 15 | 15 | 3 |
| 43 | 0 | 0 | 27 |
| 44 | 0 | 0 | 33 |
| 45 | 0·1 | 0·1 | 8 |
| 46 | 15 | 15 | 11 |
| 47 | 0 | 0 | 17 |
| 48 | 1 | 1 | 10 |
| 49 | 0·1 | 0·1 | 17 |
| 50 | 1 | 1 | 11 |
| 51 | 2 | 2 | 5 |
| 52 | 0·1 | 0·1 | 11 |
| 53 | 0·1 | 6 | 6 |
| 54 | 0·2 | 6 | 7 |
| 55 | 3 | 12 | 9 |
| 56 | 0·1 | 0·1 | 11 |

TABLE III

Fifty-six cases treated by full conjunctival hooding of the cornea during the period 1940, 4 August—1943, 30 August.

| Number | V at beginning | V at end | Days of treatment |
|---|---|---|---|
| 1 | 0·1 | 2 | 5 |
| 2 | 0·1 | 0·1 | 6 |
| 3 | 3 | 20 | 4 |
| 4 | 0·1 | 12 | 7 |
| 5 | 0 | 0·5 | 4 |
| 6 | 0·1 | 1 | 6 |
| 7 | 0 | 15 | 4 |
| 8 | 0 | 3 | 5 |
| 9 | 0·1 | 0·1 | 5 |
| 10 | 0·5 | 25 | 5 |
| 11 | 0·1 | 6 | 5 |
| 12 | 0·1 | 8 | 6 |
| 13 | 0 | 6 | 7 |
| 14 | 0 | 0·2 | 8 |
| 15 | 0·1 | 8 | 6 |
| 16 | 0 | 8 | 5 |
| 17 | 0 | 0·1 | 5 |
| 18 | 0·1 | 0·1 | 4 |
| 19 | 2 | 2 | 6 |
| 20 | 0 | 0 | 7 |
| 21 | 0·1 | 10 | 5 |
| 22 | 0 | 2 | 4 |
| 23 | 0·1 | 15 | 6 |
| 24 | 3 | 6 | 5 |
| 25 | 2 | 4 | 6 |
| 26 | 4 | 8 | 5 |
| 27 | 0·1 | 3 | 6 |
| 28 | 0 | 0·1 | 5 |
| 29 | 0·1 | 0·1 | 7 |
| 30 | 1 | 2 | 5 |
| 31 | 0·1 | 10 | 6 |
| 32 | 0 | 15 | 5 |
| 33 | 0 | 0 | 13 |
| 34 | 0·1 | 6 | 6 |
| 35 | 0·2 | 3 | 5 |
| 36 | 0·1 | 0·1 | 6 |
| 37 | 2 | 25 | 4 |
| 38 | 0 | 0 | 6 |
| 39 | 1 | 30 | 7 |
| 40 | 0·1 | 10 | 5 |
| 41 | 0·2 | 8 | 9 |
| 42 | 0·1 | 0·1 | 5 |
| 43 | 0 | 6 | 7 |
| 44 | 0·1 | 12 | 5 |
| 45 | 3 | 20 | 6 |
| 46 | 0·1 | 1 | 6 |
| 47 | 0·2 | 12 | 7 |
| 48 | 1 | 20 | 5 |
| 49 | 0·1 | 2 | 4 |
| 50 | 0 | 3 | 8 |
| 51 | 0·1 | 0·2 | 5 |
| 52 | 3 | 3 | 5 |
| 53 | 0·2 | 4 | 7 |
| 54 | 1 | 25 | 5 |
| 55 | 0·1 | 4 | 6 |
| 56 | 0·1 | 15 | 5 |

To the reading of the tables it has to be mentioned, the visual acuity is recorded in oxyoptries of Blaskovics, as it renders the statistical and comparative discussion of this value very easy. For the rest it is easy to turn from oxyoptry to the current expression of d/D: one has only to make a division by 60, *e.g.*, 3 oxyoptries= 3/60; 60/o=60/60=6/6. (The sign of oxyoptry is /o).

Lack of light perception is recorded by 0; light perception is similarly recorded by 0, as $1/\infty = 0$, and its practical value is 0 too; hand-movement is recorded by 0, 1/o; counting fingers before the eye 0, 2/o. (It is to be born in mind, this 0, 1 and 0, 2 does not mean one tenth vision, but one tenth oxyoptries).

We find the following facts by simple calculation in the tables.

The 56 cases of Table I sum up to 147, 1/o of visual acuity at the beginning of the treatment; finally round 400/o. Out of every 100/o there became 270.

In the second table this sum total is only 38,9 at the beginning; finally it has grown up to 233, 9/o. From every 100/o became 600.

The average of the added two tables says that by conservative treatment we could raise every 100 oxyoptries to 435.

In the third table we could not start with the visual acuity on admission, as we tried generally first the conservative treatment, and operation was only proposed in a progressive case (except serious cases with very low sight at the beginning of the treatment). Hence the second row shows the vision before the intervention. The sum total is only 29,7 /o, that was raised at last to 411,7 /o; in per cent. this would say that every 100 /o became the relatively enormous sum of 1386,2 /o.

But there is arising again a difficulty in not allowing the values to be compared directly. The final visual acuities of Table I and II are recorded on discharge from the clinic, while those of Table III 6-8 months later, after having removed the covering from the cornea. It is very probable, that after the lapse of half a year the vision of the first and second groups improved appreciably also. As we do not work with exact values, and we intend only to avoid a generally erroneous conclusion, we try to eliminate this difficulty by presuming a further improvement of 100 per cent. in the first and second tables and only of 10 per cent. in the hooded cases.

So in conclusion we might state we could augment 100 visual units to 870 by conservative treatment, and to 1,524 units by the total hooding; hence the superiority of the latter seems to be well proved.

There are still some further comparable points regarding vision, *e.g.*, the number of cases improved, worse, and unchanged.

TABLE IV

| | Improved | Worse | Unchanged |
|---|---|---|---|
| In Table I | 27 | 7 | 22 |
| In Table II | 26 | 4 | 26 |
| In Table III | 45 | 1 | 10 |

Further we can pick out the cases when qualitative vision recovered as far as quantitative, that means light perception became again at least finger-counting.

TABLE V

| | |
|---|---|
| In Table I ... ... ... ... | 0 |
| In Table II ... ... ... ... | 0 |
| In Table III ... ... ... ... | 12 |

The contrary is similarly instructive, namely, how often qualitative sight turned into quantitative or less, that is, how often the sight has been lost.

TABLE VI

| | |
|---|---|
| In Table I ... ... ... ... | 5 |
| In Table II ... ... ... ... | 3 |
| In Table III ... ... ... ... | 0 |

From Table V we could deduce as a rule, that whenever a patient has a vision of not more than 1/o, it is only the total hooding that promises still some small serviceable sight at all.

Table VI is instructive too; it seems to show that the hooding secures us against full visual loss whenever the operation was not made too late. If panophthalmitis is present, restoration of the sight naturally cannot be hoped for any more.

The duration of the hospitalization is much in favour of the hooding. The conservative treatment required averages 14 days, the hooding on the other hand only 6 days. And in these 6 are also included the cases with extirpation of the lacrimal sac, sometimes with inevitable suppuration lengthening the treatment to 8-9 days. Eliminating these cases there remain only 4 days. To these have to be added the 3 days at a later date when the patient returns for removal of the hood.

But these data convincing as they may be, it is the clinical observation that remains conclusive for the surgeon. Pain, lacrimation, irritation, oedema all disappear a few hours after the operation, showing the instantaneous effect of our intervention. The wound of the conjunctiva heals shortly, and the patient leaves hospital though not seeing, yet with the feeling of being healed.

And what I believe to be the most important point in the whole proceeding, the surgeon himself no longer has that annoying feeling of observing a serpiginous ulcer progressing inevitably from day to day under his care.

The time of re-opening has to be set at least 6 months after the operation. Although the healing process begins at the moment of the covering, the pneumococci remain still alive for a time, probably with gradually decreasing virulence. Would we re-open the hooding,

say 2 weeks later, the ulcer would inflame again, and we would be compelled to cover the cornea again, as has happened. Even 2-3 months later we have seen a weak relapse with a small hypopyon for a few days. As far as our observations go, the interval of at least 6 months has to be kept. It is surprising, how willingly our patients wait, till the set term is over.

The re-opening is a simple procedure. We lift the conjunctiva somewhere on the cornea, make a hole in it through which we introduce the scissors and cut away the flap all around inside the limbus. The parts grown together are detached as a pseudopterygium by iris-spatula and keratome. One has to take care not to leave a thin capsular layer on the cornea. The eye is dressed for 1 to 3 days.

Encouraged by the satisfactory results, recently we have begun to extend considerably the sphere of application of the total hooding, *i.e.*, to all acute and chronic keratitic processes unhealed or not healing well, such as ulcerated and degenerated pannus, ulcus destruens, herpes corneae, kerato-mycosis, neuroparalytic keratitis. Once we applied it to an enormous exophthalmos in Graves' disease with excellent result.

Thus the total conjunctival hooding of the cornea became at my clinic an increasingly employed proceeding for keratitic processes and it is my firm conviction that we can save eyes by it, that would be otherwise inevitably lost.

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## LOCAL SULPHONAMIDE THERAPY OF DENDRITIC ULCER*

BY

H. L. HUGHES

LONDON

IN the early days of sulphonamide therapy Kleefeld (1938) recorded favourable results from the general administration of the drug in six cases of dendritic ulceration and in twenty cases of corneal herpes. Schmid and Saubermann (1942) likewise obtained satisfactory results in five out of twenty-one cases of herpes corneae. Most

* Received for Publication, July 18, 1947.

observers, however, have had a less favourable experience but Sorsby (1944) has drawn attention to the value of local therapy in dendritic ulcer. He reported unexpectedly encouraging results from the intensive use of local sulphonamide therapy in sixteen consecutive cases. Improvement was generally rapid and most eyes, though not fully cured, were symptomless within ten to fourteen days.

## A Series of 16 cases

*Clinical features.*—Local therapy was employed in a series of sixteen consecutive cases seen during January—April, 1947. The clinical details are set forth in Table I. It will be noted that twelve cases out of sixteen responded to treatment, and that in six of these twelve cases, the response was particularly good. The cases showing a good response (Nos. 1—6 in Table I) showed the following features:—

(1) Morphologically the ulcers were all small, typical dendritic figures occupying an area about 1 × 1½ mm. in an otherwise healthy looking cornea.

(2) Sensation was diminished in three cases, normal in two, and appeared relatively increased in one.

(3) The duration of the symptoms before treatment varied from 7—21 days, and all cases were clinically cured within 8 days.

The six cases that gave a fair response, varied from the first group in that:

(1) The ulcers were more extensive. In two cases the dendritic figure appeared upon a cornea the seat of pre-existing ulceration of long duration.

(2) Sensation was diminished in all cases, and in three remained absent throughout treatment. In the remaining three it was very slow in returning.

(3) The duration of the symptoms before treatment varied from 2—10 days. The total duration of treatment was from 14—28 days, but the cases were all asymptomatic in 6—13 days.

The last group of four cases included one which was identical clinically with those of Group 1, whilst three had much more marked corneal involvement, varying from multiple punctate opacities to generalised oedema of the cornea. Case No. 16 was associated with German measles and showed a severe lesion.

## Mode of Treatment

Six per cent. albucid ointment (Schering) was instilled thrice daily, and the entire corneal surface painted once daily with 30% albucid solution. This necessitated a daily attendance.

As may be seen from Table I, the subsidence of acute symptoms was rapid in successful cases, and the eye rapidly became white.

TABLE I. *Clinical features in sixteen cases of dendritic ulcer treated by sulphonamides locally.*

| No. | Sex | Age | History of previous attack | Duration in days before treatment | History of preceding febrile disturbance | Presence of febrile disturbance when first seen | Extent of ulcer | Rest of cornea | Corneal sensation | Number of days to control acute symptoms | Total number days treated | Response to local sulphonamide therapy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F | 58 | None | 21 | No | None | Small | Two punctate opacities | Diminished | 3 | 8 | Good |
| 2 | F | 29 | None | 10 | Yes | None | Small | Clear | Diminished | 2 | 8 | Good |
| 3 | M | 27 | None | 10 | Yes | None | Small | Clear | Increased | 3 | 3 | Good |
| 4 | M | 35 | None | 4 | Yes | None | Small | Two punctate opacities | Normal | 3 | 3 | Good |
| 5 | M | 43 | None | 4 | Yes | None | Small | Clear | Normal | 6 | 6 | Good |
| 6 | M | 53 | None | 7 | Yes | None | Small | Clear | Diminished | 6 | 6 | Good |
| 7 | F | 34 | Yes (3) | 2 | Yes | None | Small | Old scar | Diminished | 6 | 27 | Fair |
| 8 | F | 39 | None | 11 | None | None | Small | Clear | Diminished | Not definite | 48 | Fair |
| 9 | M | 58 | None | 10 | Yes | None | Moderate | Clear | Diminished | Developed atropine irritation | 18 | Fair |
| 10 | M | 29 | None | 6 | Yes | Yes (Associated Herpes Labialis) | Large | Clear | Diminished | 7 | 21 | Fair |
| 11 | F | 8 | Yes (4) | 6 | None | None | Large | Old vascularised scar | Diminished | 13 | 13 | Fair |
| 12 | F | 40 | None | 7 | No | None | Moderate | Clear | Diminished | 7 | 28 | Fair |
| 13 | M | 58 | None | 14 | None | None | Small | Clear | Diminished | Not definite | Still under treatment after 60 days | Poor |
| 14 | M | 49 | None | 10 | Yes | None | Moderate | Multiple punctate opacities | Diminished | Not definite | Still under treatment after 70 days | Poor |
| 15 | F | 43 | Yes | 7 | Yes | None | Large | Old vascularised scar | None | Not definite | Still under treatment after 52 days | Poor |
| 16 | M | 8½ | Yes | 8 | Yes | Yes (German measles) | Large | Oedematous | Diminished | Not controlled | Changed to iodine after 11 days | Poor |

Routine guttae atropine 1% daily, and a pad and bandage was used in all cases. The cases that were not controlled by local sulphonamide were treated by iodine cauterisation. The response to iodine therapy in Case No. 16 (associated with German measles) was dramatic, after 11 days treatment without any obvious response to albucid.

*Prognosis.*—Clinically the cases fall into three categories. In the first the lesion is superficial and does not appear to penetrate beyond Bowman's membrane. On painting such a case the characteristic figure is removed and a diffuse stain is left. This healed rapidly under the local therapy.

In the second group the lesion goes deeper into the substantia propria, and the dendriform figure can still be made out after removal of all loose epithelium. These cases took longer, but healed without severe scarring, though some scarring was always present.

In the third type there was diffuse opacity in the substantia propria. Whether arising *de novo* or superimposed upon an old corneal lesion these cases proved more difficult to treat.

The age of the patient did not appear to influence the type, activity, or response to treatment.

Corneal sensation rather than size of the ulcer seems to afford the best guide to the progress of the lesion. Cases with marked depression of sensation were slow to heal, and healing progressed parallel with the return of sensation. Cases with little or no loss of sensation when first seen responded rapidly.

## Theoretical Considerations

Dendritic ulcer is regarded as a herpes virus infection. Theoretically it should not respond to sulphonamide therapy. As Sorsby points out the good results recorded by him (and confirmed in the present study), raise the question whether the current views on the aetiology of dendritic ulcer are valid. It is, of course, also possible that the high concentration reached by local treatment is effective against the virus.

My thanks are due to Professor Arnold Sorsby for the constant help and encouragement he has given me, and to the members of the staff of the Royal Eye Hospital who have helped me to obtain the material and assisted me in every possible way.

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# DATA ON THE OCCURRENCE OF CALCIFICATION IN THE EYE TISSUES*†

BY

MAGDA RADNÓT

BUDAPEST

ONE of the most widely known degenerations of the cornea occurs in the form of zonular opacity, which can be observed in the region of the palpebral aperture in the form of a band narrowing towards the centre from the limbus, leaving here a narrow strip of the cornea free. The anatomical basis of this clinical picture is a calcified degeneration of the layers under the epithelium of the cornea. The text-books distinguish two or three forms of zonular opacity. One is pathologically quite a different deformation, occurs as an occupational injury, principally to hat-makers, and is caused by the deposit of rabbit hairs in the cornea. The other two forms are the so-called primary and secondary ribbon-type degeneration, the difference between them being that the primary occurs in eyes otherwise healthy, the secondary in damaged eyes, usually those blinded by uveitis. Merz-Wigandt has warned that this distinction is not justifiable, as it is possible that the primary also occurs in previously injured eyes but that it cannot be demonstrated clinically.

As we have intimated, the essential change is a lime deposit. This, according to Leber, develops the clinical form of zonular opacity, because the greatest degree of evaporation is in the region where the eye opens and the calcium precipitates here from the greater calcium-containing liquid coming into the cornea. This explanation is not universally accepted, but, as Hippel remarked, no one knows a better one. Imre's observation is very interesting, to the effect that in one case of transplantation of the cornea because of zonular opacity, a change similar to zonular opacity showed itself in the transplanted disc too.

In the following we deal with cases of the so-called ribbon-type degeneration, seeking what changes we find in the other tissues of the eye, first of all whether we find calcareous deposits elsewhere too.

Calcification also occurs in the cornea secondarily in leucoma and, very seldom, in the form of primary calcareous deposit. In Axenfeld's well-known primary case and in one case of Imre's the cause of the calcareous deposit could not be cleared up. These changes do not come within the limits of the present investigations, no more do those cases when lime is deposited in the cornea in connection

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† Received for publication, June 9, 1947.

with lime injury (Lisch), nor the lime deposit occurring in osteomalacia (Spanlang).

At a meeting of the Hungarian Ophthalmological Society on October 5, 1941, we presented 6 cases, 4 of which were zonular opacity, the other 2 consisting of lime in the cornea in the form of irregular deposits. In all 6 cases we found lime deposits in other tissues of the eye-ball also. Since then we have, with special attention to this viewpoint, investigated the eye-balls in the corneas of which we saw calcareous degeneration. In the following, on the

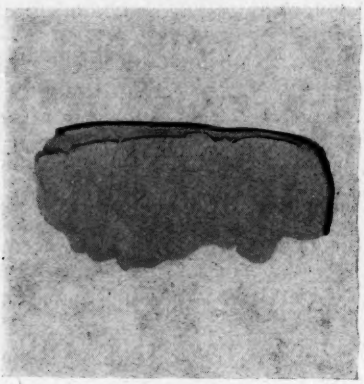

FIG. 1.

Calcareous deposits in Bowman's membrane and beneath it.

FIG. 2.

Bowman's membrane absent.

FIG. 3.

Calcareous scar tissue under the epithelium.

basis of 12 cases, we describe the occurrence of lime in the eye tissues. In ten of them lime was deposited in the cornea as zonular opacity, in the other two in an irregular form.

Walsh mentions similar degeneration of the conjunctiva in a case of zonular opacity arising after iridocyclitis, and under a figure of Hippel's we read that "Bandförmige Hornhauttrübung . . . Auge mit ungewöhnlich starker Verkalkung in der Retina."

In a case of zonular opacity we found calcareous deposit in the region of Bowman's membrane and in the form of discs in layers under it (Fig. 1). In most cases hyaline granules could also be found

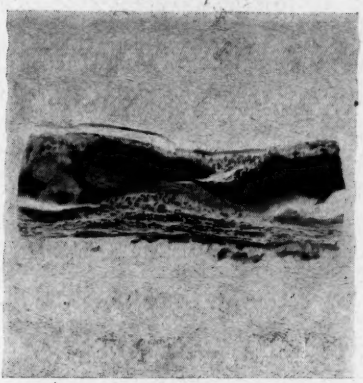

FIG. 4.

Bone lamellae in the choroid.

beside the calcareous lamellae. In the more advanced cases the calcification is very extensive. Bowman's membrane is lacking, and scar-tissue develops under the epithelium (Figs. 2 and 3). Lime can most frequently be found in the choroid also in these cases, that is, in bone lamellae. Besides the changes in the cornea to be seen in Figs. 2 and 3, we found bone lamellae in the choroid (Fig. 4). Much more extensive bone formation is to be seen in the case shown in Fig. 5, where, in addition, a calcareous degeneration is also to be observed in the subluxated lens. Somewhat more rare is the deposit of lime in the degenerate retina, or in chorio-retinitis scars (Fig. 6).

If the lime deposit is extensive the changes will be perceptible with X-rays. In Fig. 7 can be seen a bone cup in place of the choroid and the calcified lens; the same bone cup dissected is shown in Fig. 8. In Fig. 9 is a case of greater calcification of the lens, with a smaller amount of lime observable in the choroid. The X-ray photographs were taken by Dr. Luzsa.

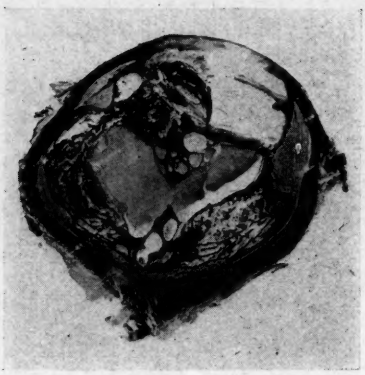

FIG. 5.

Half eye showing extensive bone formation and calcareous degeneration.

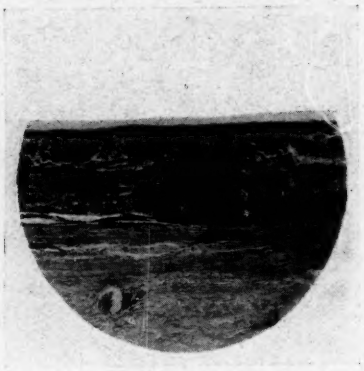

FIG. 6.

Lime deposit in degenerate retina.

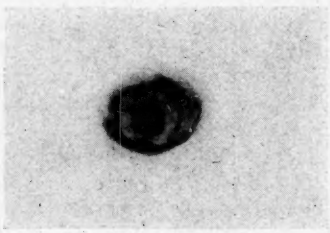

FIG. 7.

Choroid replaced by a bone cup and lens calcified. X-ray photograph.

FIG. 8.

Bone cup dissected out of eye.

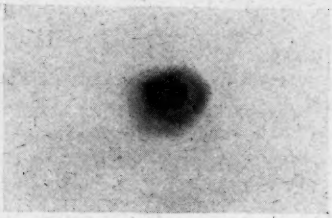

FIG. 9.

Lens more calcified than in Fig. 7, choroid less calcified. X-ray photograph.

FIG. 10.

Bone lamellae in chorio-retinal scar.

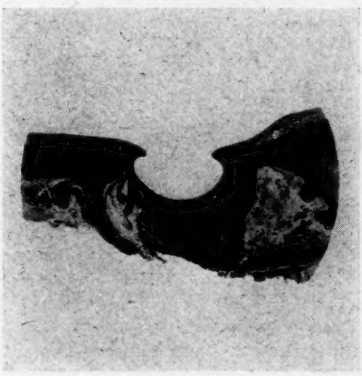

FIG. 11.

Secondary glaucoma, accompanying chronic uveitis.

Cataracta calcarea, according to Szily's observations, generally occurs in connection with uveitis and accompanies lime deposit in the choroid.

In exceptional cases the bone formation can extend into the tissues of the cornea, as in Zwiauer's case.

In chorio-retinal scars not only simple lime deposits but also the formation of bone lamellae is possible (Fig. 10). Zonular opacity is to be observed in most cases in atrophied eyes, and in Fig. 11

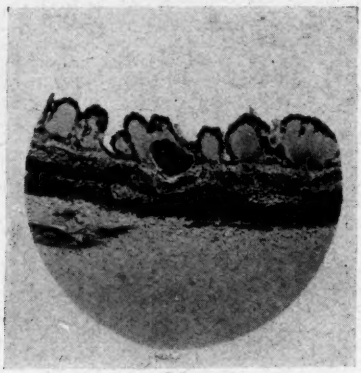

FIG. 12.

Calcareous deposits in lamina vitrea warts.

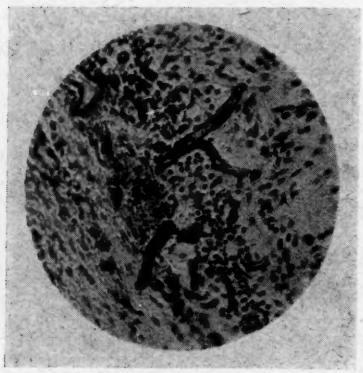

FIG. 13.

Calcareous deposits in detached retina of same case.

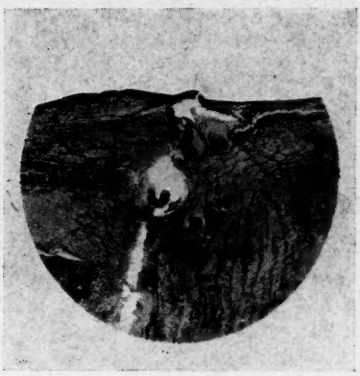

FIG. 14.

Calcareous lamellae in optic nerve.

there can be seen in a case of ours the secondary glaucoma accompanying chronic uveitis which led to enucleation (Fig. 11).

In atrophied eyes lamina vitrea warts are very often to be seen, but only very rarely is a lime deposit found in them, as in Fig. 12. In the same case we saw calcareous deposition in the layer of the retina which was wholly detached and gathered into wrinkles in the anterior part of the vitreous body (Fig. 13). In the wall of the bigger obliterated vessels, or in the hyaline centres which are to be found in their place, the lime deposit is principally to be seen in the detached retina.

It does not strictly belong to our subject but because of its rarity we present Fig. 14, where we find lime lamellae in the optic nerve in an eye blinded by a malignant exophthalmos. The corpora amylacea occurring in the covering of the optic nerve usually contain more or less lime.

On the basis of our investigations, therefore, we see that when lime is deposited in the cornea in zonular opacity or in eyes injured in some other way, a lime deposit is also to be found in the other tissues of the eye-ball.

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# TREATMENT OF PERFORATED CORNEAL ULCER BY AUTOPLASTIC SCLERAL TRANSPLANTATION*†

BY

SVEN LARSSON

LUND

THE method generally used in trying to close a persistant corneal defect is either that of covering it with conjunctiva which has been detached in some way, or that of corneal grafting. In cases where the defect lies outside the optic zone, and optical considerations do not arise, a conjunctivoplasty would seem to be the current method, and is in fact successful in most cases. If, however, transparency is aimed at, transplantation of cornea has lately been used with ever increasing frequency.

In the literature at my disposal I have found no account of attempts to close a persistent corneal defect or fistula by transplantation of sclera taken from the patient's own eye. Such an attempt will be described here.

The patient, a seven year old girl, M.E. 977/45, had previously been healthy. In July, 1945, a left-sided exophthalmus occurred, and as the X-ray examination showed a decalcification of the left wing of the sphenoid the doctor in charge of the case suspected a tumour with intracranial extension. The patient was, therefore, sent to the neuro-surgical clinic of the Serafimer Hospital in Stockholm. A copy of the patient's case history has been placed at our disposal.

The following data were recorded on admittance on September 14, 1945:

Vision R.E. 5/5, L.E. 5/10.

The right eye showed no symptoms of abnormality.

The left eye protruded considerably. Hertel's exophthalmometer showed 13 mm. for the right eye and 19 mm. for the left eye, *i.e.*, an exophthalmos of 6 mm.

* Received for publication, July 23, 1947.

† From the Ophthalmic Clinic of the University of Lund, Sweden. Chief: Professor Sven Larsson.

Papilloedema with about 4D. protrusion in the left fundus.

The X-ray showed a decalcification in the rear and lateral wall of the left orbit, which was probably due to atrophy caused by pressure. For this reason an orbital tumour was assumed.

The patient was operated on September 21 (Prof. Olivecrona), and a cavernous angioma was removed after unroofiing the orbit. The histopathological examination revealed a cavernous haemangioma. On the following day the patient became unconscious and had Jacksonian fits. As a haematoma was suspected, the bone flap was lifted and a medium-sized extradural haematoma was removed.

Ptosis, protrusion of the left eye, and failure of the eyelid to cover the lower part of the cornea were recorded during the post-operative course. An ulcer appeared in the lower part of the cornea. In other respects progress was favourable, and the patient was discharged on October 5, 1945, to be treated further by an eye-specialist in her home region.

The patient's lagophthalmic keratitis did not, however, heal. A descemetocele appeared, which was cauterized and covered by a conjunctival flap. The operation, repeated no less than three times, was unsuccessful. The wound grew larger, nutritive impairment was suspected, and on December 28, 1945, the patient was sent to the ophthalmological clinic at Lund.

We recorded the following data:

Vision R.E.=1 (±0). L.E.=0·2; no improvement with glasses. Right eye normal.

Left eye: A slight ptosis. The eye turned slightly downwards and outwards indicating paresis of the IIIrd nerve. The eye did not protrude. Intense injection (as a result of all the earlier operative measures). In the lower part of the cornea a few mm. from the limbus, a descemetocele somewhat larger than the head of a pin, was discovered and close to this the cornea was a muddy grey. The eye was otherwise free from irritation, and there were no signs of iritis. Ophthalmoscopically the eye was normal. Reduced sensibility of the cornea could not definitely be established.

The patient was operated on on January 12, 1946. A conjunctival flap was dissected downwards, during which process the bulbus became rather soft owing to leakage from the corneal defect. This, however, only slighty impeded the operation. The sclera near to the insertion of the external rectus was exposed and a scleral disc was punched out near the lower border of the rectus tendon by means of a 2·5 mm. trephine. This was lifted up without damaging the choroid. The corneal

hole was manipulated in order to obtain a circular defect, a good 2 mm. in diameter and as clean cut as possible. The scleral disc was then easily fitted into the hole, whereupon the conjunctival flap was drawn over the graft and sutured. A double bandage was applied.

The post-operative course was without complications: no irritation at all; the anterior chamber was soon regenerated.

January 26, 1946; no irritation. The conjunctival flap still remained and covered a large part of the cornea. Through the flap the white scleral disc could be seen in position. No fistula. The patient was discharged.

March 7, 1946; no irritation. Through the translucent conjunctival flap, which now covered only the lower part of the cornea, the transplanted white scleral disc was still seen to fill up the former defect. The corneal surface was completely smooth. The pupil was round, but nasally and downwardly the iris had probably healed a little to the inner side of the cornea. No fistula. Tension, 22 mm. Hg. Vision=0·5 (+1.0 D.Sph.+2.0 D.Cyl. 180°). A slight ptosis still persisted, together with a slight deviation, downwards and outwards, of the bulbus.

## Discussion

The corneal affection communicated here was undoubtedly a lagophthalmic keratitis, since it arose in connection with a post-operative inability to close the eye. It is, of course, impossible to decide whether impaired circulatory and nutritive conditions—caused by the operative measures—contributed towards the genesis of the corneal injury. There were, however, no grounds for assuming neuroparalytic keratitis.

The ulcerative corneal process advanced, and as no less than four attempts had been made by others to cover the wound and cause it to heal by means of common cauterization and conjunctivoplasty, I thought a plastic operation of a different kind was indicated. Because of the comparatively peripheral site of the ulcer, the graft did not need to be transparent and therefore optical considerations could be disregarded. As a result of the wide experience of scleral trephining I had gained from my earlier operations for detachment of the retina, I was attracted by the idea of trying to close the corneal defect by means of a scleral disc punched out of the same eye. The operation here described in detail did not present any difficulties, and its course was entirely favourable. The method might well be remembered in cases of corneal ulcer or fistula where other more simple methods do not lead to the desired result.

**Summary**

In connection with an operation for retrobulbar haemangioma, a seven year old girl got a lagophthalmic corneal ulcer which developed into a descemetocele. Four attempts elsewhere to close the ulcer with a conjunctival flap did not lead to the desired result. The wound got larger, and there was danger of perforation. A scleral disc was punched out of the same eye and transplanted into the wound, after the edges of the latter had been excised. The graft was covered with conjunctiva. The result was good: the transplant fitted in comfortably, the ulcer closed, and vision was comparatively good.

## ANNOTATION

### Sir Charles Sherrington, O.M., F.R.S.

Sir Charles Sherrington celebrated his ninetieth birthday on November 27 last. When we remember that some of his experiments on ocular movements and visual phenomena provided the most crucial evidence for great discoveries, it is a fitting and altogether congenial duty that ophthalmologists should add their quota to the paean of praisé. His investigations of muscle spindles and the afferent nerve fibres from extrinsic eye muscles initiated his study of proprioceptive nerves; and this in turn led to the discovery of the physiological substrata of posture as fully elaborated by him and by his pupil Magnus. It was, too, from conjugate movements of the eye, induced by stimulation of the frontal ocular motor area, that he obtained some of the strongest evidence of the inhibition of antagonistic muscles, thus again opening up a vast new conception of active processes other than mere excitation occurring in motor phenomena.

Pure mathematicians are always anxious to obtain the neatest and most "beautiful" solution of a problem. Sherrington's experiments on binocular vision belong to this category. They prove the absence of simple summation of the responses from the two eyes; but the philosophical meaning goes far beyond so simple a fact. They show that "for each eye the sensorium carries elaboration of sub-perceptual and perceptual vision to a considerable pitch of mental completeness without marked collaboration between the visual processes of the two eyes."

Of even more far-reaching importance were his experiments on cortical motor areas, which broke down the jejune idea of mere anatomical representation of muscular action in the cortex cerebri, and so "first within the brain discerned the meaning of its ordered

ways, and man of his own nature learned to thread the labyrinthine maze" (W. Russell Brain*). At the hands of his pupil Granit, the processes of excitation, facilitation, inhibition, and so on, demonstrated by Sherrington in the spinal cord, have been shown to regulate impulses in the retina and optic nerve. This isolated mass of brain, with its equally isolated intra-cerebral pathway, the optic nerve and optic tract, are thus shown to be a specially favourable locus for future experimentation. And so Sherrington has been led on from "The Integrative Action of the Nervous System" to the profound philosophical conception of the relationship of body and mind contained in "Man on his Nature."

Great then are Sherrington's scientific claims to greatness—claims which, as has been pointed out, justify comparison with Harvey, marking an epoch in biology. And those who have had the privilege of knowing Sherrington, the man, realize that his meticulous scientific integrity is combined with an endearing kindliness, and a modesty without which no man is truly great.

## FACULTY OF OPHTHALMOLOGISTS

### Report of Council Meeting on October 10

THE Honorary Secretary drew attention to the very brief report of the Faculty's activities that had appeared in the British Medical Journal and the Lancet, as compared with that in the British Journal of Ophthalmology. It was agreed that the Honorary Secretary should ask the British Medical Journal and the Lancet to realise that the report was already cut to a minimum and to ask for it to be printed as submitted.

The Faculty had asked the British Medical Association to confirm the statement that compensation would be given for consultant practices and a reply has been received that the buying and selling of consultant practices in general was not prohibited by the National Health Service Act and for this reason the compensation provisions of the Act did not extend beyond the cases of general practitioners whose names were entered "on the appointed day on any list of medical practitioners undertaking to provide general medical services."

It was reported that the Medico-Political Standing Committee had submitted a Memorandum to the Evidence Committee, sitting under the Chairmanship of the President of the Royal College of Surgeons, on the remuneration of consultants and specialists.

* *Lancet*, November, 22. 1947.

With reference to orthoptic matters, it was reported that the Local Authorities would not accept a salary scale for orthoptists approved by the Faculty or any other professional body, but asked for a properly negotiated scale between employers and employees. It was, however, noted that the Joint Negotiating Committee's salary scale was acceptable to the Faculty and therefore it was decided to take no further action.

The question of standards of vision for orthoptic students was reviewed and the following resolution adopted:—

> "Visual acuity should be 6/9 corrected in each eye, with full binocular vision, It is undesirable to have more than 7 D. refractive error in any meridian, but such cases could be accepted at the discretion of an ophthalmic surgeon."

A letter had been received from the Ministry of Education requesting the Faculty's opinion on plastic lenses for school children. It was decided that, in view of the present state of development of plastic lenses, particularly their softness and their liability to scratch, the Council did not consider that they were a practical proposition for universal use at the moment.

Following correspondence with a Joint Committee set up by the B.M.A. and the Pharmaceutical Society to compile a National Formulary suitable for use in connection with the National Health Service, the Faculty nominated three representatives to serve on a Sub-Committee to consider the draft section of the Formulary concerning ophthalmology.

The attention of the Faculty Council was called to the fees for School Ophthalmic Work from two sources. In view of the fact that the scale of fees for all Local Authority work had been negotiated by the B.M.A. for all consultant and specialist work, it was decided that no further action could be taken at the moment.

## BOOK NOTICE

**Contact Lenses.** By THEO E. OBRIG. Second edition. 546 pp., 180 illustrations. Published by The Chiltern Co., Philadelphia, Pa. 1947.

This edition is larger than its predecessor. It gives a general account of the history and principles of contact lens work and a detailed description of the fitting methods practiced by the author. The indications for the use of contact lenses are fully described, applied anatomy, physiology, and optics are discussed, and a short chapter is devoted to the properties of plastics. The detailed description of technique applies to the author's All Plastic moulded

contact lens. The eye is moulded in mouldite, and a semi-finished lens is produced to correspond with this mould. This is modified by grinding to give an exact fit. The formation of Sattler's veil and the probable causes are described in detail, but no mention is made of fenestration as a possible solution of this problem. This book contains much that is of interest to all ophthalmologists, and much that is of value to all students of contact lenses.

## CORRESPONDENCE

### CONTACT GLASSES AND VEILING

*To the Editors of* THE BRITISH JOURNAL OF OPHTHALMOLOGY.

DEAR SIRS,—If the cornea and adjacent conjunctiva is examined with the slit-lamp immediately after a contact lens is removed when veiling is well established it will be seen that this condition is an oedema of both the cornea and conjunctiva which are not supported by (that is, are not in contact with) the lens. If a contact lens containing paraffin wax melting at body temperature is inserted and left in for an hour or so in a case which easily develops veiling, and the wax is chilled to set it before removing the lens, a plaster model of the eye may easily be made. Such a cast shows a heaped up frill of conjunctiva surrounding the cornea and tending to fill the space between the eye and the lens, where a pool of fluorescein would appear when fitting. If a channel, say ½ mm. wide and ¼ mm. deep, is cut leading away from the corneal segment of the contact lens and on the inner surface and the lens worn until veiling occurs, when the lens is removed the eye will show an oedematous frill of conjunctiva around the limbus and also that the conjunctiva is herniated into the channel. This raised conjunctiva is easily seen with the naked eye. It is generally recognised that a lens under which veiling has developed "sticks" and is difficult to remove and it can also be shown that at this time the space between the lens and the cornea is less than it was when the lens was inserted.

These facts seem compatible only with the supposition that veiling is due to oedema of the unsupported eye tissues under a contact lens and is due to direct physical suction. This negative pressure may be developed as follows:—a lens with corneal clearance but with an edge fit, when pressed (by the lids) against the globe creates a positive pressure in the fluid under the lens which easily escapes at the lens edge. When the pressure is released, however, the lens edge acts as a valve and neither air nor

PROFESSOR HENNING RØNNE

# OBITUARY

## PROFESSOR HENNING RØNNE

Dr. E. Godtfredsen writes:—

Professor Henning Rønne died on September 28, after having been seriously ill for more than a year with hemiplegia and aphasia. The death of Professor Rønne is a sad loss to Danish ophthalmology, which he, more than any other, formed and developed after his appointment as Professor of Ophthalmology in Copenhagen in 1931.

Rønne was born on May 25, 1878, and graduated M.B. B.Ch. in 1903. He immediately began to specialize in ophthalmology in different Copenhagen clinics. Among his superiors Bjerrum was the man who became of the greatest importance to him. Rønne's scientific production comprised in the first instance a number of original papers dealing with the visual pathway, investigations into the primary visual centres in the midbrain, and visual field investigations with demonstration of the nasal step in glaucoma simplex. The series of visual pathway papers was introduced in his M.D. thesis in 1910: "Anatomical, Pathological, and Clinical Studies on Alcoholic Amblyopia." Immediately before his illness Rønne finished a paper giving a comprehensive account of the Architecture of the Visual Pathway. Rønne's numerous contributions to periodicals show his wide interests and knowledge of such subjects as colour sense, Weber's law, dark vision, squint, orbital inflammations, choroidal sarcoma, syphilitic choroiditis, and dyslexia, to mention only the more important.

Rønne's great interest in the pathological anatomy of the eye manifested itself in the establishment of a central laboratory attached to the Eye Department of the Rigshospital, to which all eyes enucleated in Denmark are sent.

In addition to his great work as university professor and head of the leading eye clinic of Denmark. Rønne had a large private practice. He was widely travelled and was honorary member of various foreign societies, including the Royal Society of Medicine.

Danish ophthalmology is much indebted to Professor Rønne, whose ardent and never abating interest in his profession and ever inspiring eagerness to discuss new problems will remain an unforgettable and stimulating example to us young ophthalmologists who were his pupils.

Dr. A. H. H. Sinclair writes:—

It was fortunate that a man of the late Professor Henning Rønne's remarkable ability and enthusiasm in the pursuit of clinical research should have been closely associated during his early years as ophthalmologist with Professor Bjerrum. This indeed was a mutual advantage: in this connection Rønne had the opportunity of which he fully availed himself, to become intimately acquainted with Bjerrum's method and technique. But, in addition by his keen observation of the form, position and density of visual defects found within the area of the field of vision and his great and increasing knowledge of the visual pathways, he soon became able to throw fresh light on the clinical significance of field defects he had graphically demonstrated by the use of Bjerrum's screen test. This method he described as the quantitative method.

In 1911 I paid my first visit to Copenhagen in order to become personally acquainted with Prof. Bjerrum and his already famous junior, Dr. Rønne. On arrival I found that Prof. Bjerrum had just retired from the Chair of Ophthalmology: he was, however, at work in another clinic, where I was much interested to meet him: he expressed to me his pleasure in the interest taken in his work in Britain. At the University clinic I found Dr. Rønne hard at work: I soon realised that he was very fully occupied there. He kindly invited me to his home in the evening, where I was much interested to hear his remarks as he described some of his records and charts of the visual fields: I was delighted to note the humourous enthusiasm with which he told me of fresh projects of research he had in view.

I met Rønne on two subsequent occasions: once in 1927 when he stayed with me in Edinburgh and read a Paper on Optic Neuritis to the Ophthalmological Section of the B.M.A. Meeting, and again on a later visit to Copenhagen when he was Professor of Ophthalmology.

Some years prior to my visit to Copenhagen (in 1911) Rønne had become renowned by his discovery of the 'Nasal step' in the field of vision in glaucoma. Michel in 1874 had described the anatomically arched form of the retinal nerve fibres in the temporal retina, encircling the region of the macula and forming the horizontal raphe extending from the macula to the temporal periphery. The physiological function associated with this anatomical form could not have

been demonstrated and understood unless it had been revealed by a pathological functional failure of conduction in a nerve bundle subjected to injury, in this case pressure at the margin of the optic disc.

Rønne not only recorded graphically the exact form, size and position of the nasal scotoma with its sharp horizontal limitation, (the nasal step), but referred its cause directly to the arched form and position of the temporal retinal nerve bundle. The scotoma forms the counterpart in the nasal field of the functional nerve bundle in the temporal retina.

Investigations of a similar kind were carried on by Rønne in connection with his further study of the visual pathways.

In the wide range of Rønne's activities in research the element which has most permanently impressed ophthalmologists in this country has been the diagnostic value of subjective symptoms as demonstrated by Rønne's use of the quantitative method in his careful scrutiny of the field of vision, and the application of such subjective findings on graphic records to the consideration of their significance in relation to the visual pathways.

## WARNING

*In the note on Welder's Conjunctivitis, Vol. XXXI, p. 774, it was suggested that chlorate of calcium was an error for chloride of calcium. We are informed that so strong a solution of the chloride as 2 per cent. would have dangerous caustic qualities and be unsuitable for use as eyedrops.*

tears can flow in to fill the space which tends to reform under the lens as the eyeball tends to resume its normal shape. A negative pressure is thus created and with each successive lid closure, especially if the lids are tightly squeezed, more fluid is expelled and a greater negative pressure created. This negative pressure may be accommodated in two ways. First by the actual herniation of the conjunctiva which is mobile and secondly by the passage of lymph into the tissue spaces; this oedema is first seen immediately under the epithelium. The system does not impede the centripetal flow of lymph.

It seemed to me, some years ago, that this must be the explanation of veiling—the contact lens acts as a cupping glass—but only recently have I been able to demonstrate the truth of this assumption. It is well known that a badly fitting lens, or one with a suitably drilled hole, will not cause veiling. If instead of these means a channel of suitable dimensions and location is cut on the underside of the contact lens from the lens edge to the pre-corneal space veiling is relieved and bubbles need not be introduced. The channels may be open to the under surface or designed within the body of the material of the lens.

This procedure has proved successful in twelve consecutive cases which I have recently fitted with moulded plastic lenses. I am putting forward this explanation of the condition and the method of dealing with it based upon this explanation, so that others may make use of them. More work will be needed before it is possible to define exactly the technical details as to form, position and number of the channels required. This I hope to make the subject of a formal communication in the future but it seems unjustifiable to withhold an explanation and a method of cure which may be of material assistance to others while the whole problem is being worked out.

Yours sincerely,

FREDERICK RIDLEY.

80, HARLEY STREET,
LONDON, W.1
*November* 19, 1947.

## OBITUARY

### MacGILLIVRAY of MacGILLIVRAY

MACGILLIVRAY of MacGillivray, after a long and distinguished career as an ophthalmic surgeon in Dundee, died on October 15, 1947 at the age of 82 years. He was ophthalmic surgeon to the Dundee Royal Infirmary for over 30 years, and surgeon to the

Dundee Eye Institution for 45 years. On his retirement from the latter post in 1937 he was presented with a portrait bust by Benno Schotz, R.S.A., in appreciation of his eminent services. In 1935 he retired from the post of Reader in Ophthalmology at the University of St. Andrews and later received the honorary degree of LL.D. He was for many years eye specialist to the education authorities of Dundee, Angus and Fife. During the 1914-18 war, after long service in the Territorial Army, he acted as consulting ophthalmic surgeon with the rank of major, being awarded the T.D.

Angus MacGillivray after taken an honours medical degree at Aberdeen University, worked under Priestley Smith in Birmingham and was English Secretary at the IXth. International Ophthalmological Congress in Utrecht. In Dundee his work quickly gained for him an outstanding reputation throughout the East of Scotland as well as further afield. He developed unusual skill as an operator, and was a pioneer in cataract extraction under a conjunctival bridge and in the use of retro-bulbar anaesthesia. As a teacher of his subject his clarity of mind and enthusiasm inspired many of his students to take up the study of ophthalmology, and several of them have attained distinction in the speciality.

Born at Abriachan, he was the 28th Chief of the clan MacGillivray, and an enthusiastic of things Celtic and archaeological, having published several books and articles on these subjects. He was Chief of the Dundee Highland Society in 1912. He also took a leading part in many other activities. In 1898 he was Secretary of the Section of Ophthalmology at the Annual Meeting of the B.M.A., and in 1902 Vice-president. In 1924 he was elected President of the Dundee Branch. For 13 years he acted as county controller and director of the Dundee Branch of the British Red Cross Society. Latterly he gave several years of useful service as a member of the Court of St. Andrews University.

MacGillivray of MacGillivray was a man of active mind and vigorous personality, a kindly host and an interesting conversationalist. His passing is greatly deplored by a wide circle of friends and admirers.

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## SELIG HECHT

WE regret to record the death of Professor Selig Hecht, of New York.

Professor H. Hartridge writes:—

*Many years ago Banister, Lythgoe and myself were doing some visual acuity measurements at Cambridge, out-of-doors in the sun, when a stranger approached us and stood watching us for a few minutes. I was struck at once by his appearance, because he had an exceptionally fine head and very broad shoulders.* He introduced

himself to us: he was Selig Hecht, of Columbia University. We chatted together and soon became firm friends.

During the year that he and his family were in Cambridge I learned many things about Hecht. He was a man of singular energy, initiative and inventiveness. He was also very warm-hearted. His work in the field of vision is well known to all. For no one has done more than he to put the duplicity theory on a sound basis, or to throw light on the factors concerned with the acuity of vision.

In July this year Professor Hecht visited this country again, in order to attend the International Physiological Congress at Oxford and the Conference on Colour Vision at Cambridge. During this visit he stayed a few days at Northwood with my wife and me and we were able to renew the friendship of years gone by. We noticed at once that he was far from well; it was clear that the war years had told on him as they had on us. But none of us suspected how really ill he was.

There is always a tendency for the elderly to think that there is no one to take their place, but this does indeed seem to be the case with regard to Selig Hecht. The physiology of vision has lost a leader at a time when leadership in this subject is very badly needed indeed. We mourn the loss of a true friend and a very great physiologist.

Sir John Parsons writes:—

The meeting of the International Congress of Physiology at Oxford this year attracted physiologists from all parts of the world. Among them were most of those best known for their researches on the optics, bio-chemistry, and neurology of vision. It was a brilliant inspiration of Wright, Willmer, Stiles, and others to gather them together at Cambridge in the following week for informal discussions on the problems of vision. The meeting was so successful that a volume of the chief communications is being prepared for publication.

Among those present were Hecht, Wald, Granit, and others, and it was a delightful experience to meet or renew acquaintance with them. No one showed greater enthusiasm than Hecht, and no one showed a wiser or shrewder grasp of the bio-chemical problems to the elucidation of which he has devoted his life's work. (In the *Annual Review of Biochemistry, Vol. XI, 1942*, he has given a brilliant historical review of researches on the chemistry of visual substances, with a complete bibliography). His somewhat dogmatic presentation of arguments was tempered by humour and sweet reasonableness which stripped it of all offence. I think no one was more persona grata than he; and it was a profound shock to hear of his sudden death shortly after the meeting. His name will endure to signify a landmark in the history of the physiology of vision.

## NOTES

**Honours**

SIR STEWART DUKE-ELDER delivered the Donders Lecture and received the (quinquennial) Donders' Medal at a meeting of the Dutch Ophthalmological Society at Utrecht on December 14.

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**Prize of the International Association for Prevention of Blindness**

AN honorarium of 1000 dollars to promote research work on ophthalmology is offered through the American Members of the Staff of the International Association for the Prevention of Blindness, the Jury to consist of the Executive Committee together with the President and the Officers of the Association.

The award will be made in connection with the XVIth Concilium Ophthalmologicum. Papers may be presented by any responsible research worker. The subject is to be *simple non-inflammatory glaucoma* and may include anything definitely relative to the question. The matter must be new and of such value, in the judgment of the jury, as to merit this recognition. Papers may be written in English or French; they should be those heretofore unpublished or those published between this date and October 15th, 1949. They should be in the hands of the secretary of the International Association for the Prevention of Blindness, 66, Boulevard St. Michel, Paris, through whom they will reach the Members of the Judicial Committee, not later than October 15th, 1949.

The decision of the Jury will be final.

* * * *

**University of Glasgow Post-graduate Medical Education Committee**

A systematic course in ophthalmology will be conducted from January 12 to June 11, 1948. The lectures will be given thrice weekly at 5.15 p.m. in the rooms of the Royal Faculty of Physicians and Surgeons, 242, St. Vincent Street, Glasgow. Fee twelve guineas.

Those wishing to attend should make early application to the Director of Post-Graduate Medical Education, The University, Glasgow, W.2., from whom further particulars may be obtained.

* * * *

**Compensation under the National Health Service Act in regard to Specialist practices**

THE Ophthalmic Group Committee state that some confusion exists in the minds of Ophthalmic Surgeons in relation to compensation under the National Health Service Act.

Under the Act the sale and purchase of general practices is prohibited, but the position in so far as speciality practices are concerned remains unaffected. In future years it will be much more difficult to sell specialist practices and this has been plainly stated to the Minister of Health. He "adheres to the position, and as nothing is at present in the Act to disturb the selling, there can be nothing in the Act to compensate for the loss of the right to sell."